AXIOMTEK

CEM881

4th/5th Generation Intel® Core™ Processor COM Express™ Type 6 Compact Module

User's Manual

RoHS

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If you replace wrong batteries, it causes the danger of explosion. It is recommended by the manufacturer that you follow the manufacturer's instructions to only replace the same or equivalent type of battery, and dispose of used ones.

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January 2015, Version A1

Printed in Taiwan

ESD Precautions

Computer boards have integrated circuits sensitive to static electricity. To prevent chipsets from electrostatic discharge damage, please take care of the following jobs with precautions:

- Do not remove boards or integrated circuits from their anti-static packaging until you are ready to install them.
- Before holding the board or integrated circuit, touch an unpainted portion of the system unit chassis for a few seconds. It discharges static electricity from your body.
- Wear a wrist-grounding strap, available from most electronic component stores, when handling boards and components.

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Chapter 1
Introduction

The CEM881 is a new COM Express™ Type 6 Compact Module supporting BGA type dual core 4th/5th generation Intel® Core™ i7/ i5/ i3 and Celeron® processors. It supports the most updated high speed I/Os like PCI-Express Gen 2 at 5GT/s, SuperSpeed USB 3.0 at 5Gb/s, and SATA-600 at 6Gb/s. The CEM881 does fully comply with PICMG COM.0 Rev 2.1 COM Express™ Type 6 specification. It provides 4 Lanes of PCI-Express, Gigabit Ethernet, HD audio interface, LVDS LCD and 2 configurable DDI for more flexible digital display options.

1.1 Features

- Intel® 4th /5th generation Core™ i7/ i5/ i3 and Celeron® BGA processors
- 1st bank is onboard DDR3L with memory up to 4GB (optional). 2nd bank is one 204-pin DDR3L SO-DIMM supporting up to 8GB memory capacity.
- Support 4 Lanes of PCI-Express
- 4 SATA-600
- 6 USB 2.0 ports
- 2 USB 3.0 ports
- TPM v1.2

1.2 Specifications

- **CPU**
  - Intel® 4th /5th generation Core™ i7/ i5/ i3 and Celeron® BGA processors.

- **Chipset**
  - Integrated in CPU.

- **BIOS**
  - American Megatrends Inc. BIOS.
  - 64Mbit SPI Flash, DMI, Plug and Play.
  - PXE Ethernet Boot ROM, customized default saving features, LPC-free supported, uses SPI type Flash memory.

- **System Memory**
  - One 204-pin DDR3L 1333/1066MHz SO-DIMM slot with maximum memory capacity up to 8GB.
  - Onboard DDR3L 1333/1066MHz memory supports maximum capacity up to 4GB (optional).

- **TPM**
  - Trusted Platform Module compatible with TPM1.2 Main and PC Client specification based on Intel LPC Bus Interface.

- **Expansion Interface**
  - Four lanes of PCI-Express (can be configured as 1 PCIe x4, 2 PCIe x2, 4 PCIe x1).

- **USB Interface**
  - Six USB ports comply with USB Spec. Rev. 2.0.
  - Two USB ports comply with USB Spec. Rev. 3.0.

- **SATA Interface**
  - Four SATA 6Gb/s ports supported through COM Express™ connector.

- **Graphics**
  - Integrated in processor HD graphics Gen 7.5.
  - 18/24-bit single/dual channel LVDS interface.
  - Two DDI ports support HDMI/DVI/DisplayPort.

- **Ethernet**
  - One 1000/100/10 Base-T provided by Intel® I218LM with integrated boot ROM.

- **Audio**
  - HD link interface to carrier board for codec.

- **Power Management**
  - ACPI (Advanced Configuration and Power Interface).

- **Form Factor**
  - Compact module 95mm x 95mm.

1.3 Utilities Supported

- Chipset driver
- Graphics driver
- Ethernet utility and driver
- ME driver
- USB 3.0 driver

Note

All specifications and images are subject to change without notice.

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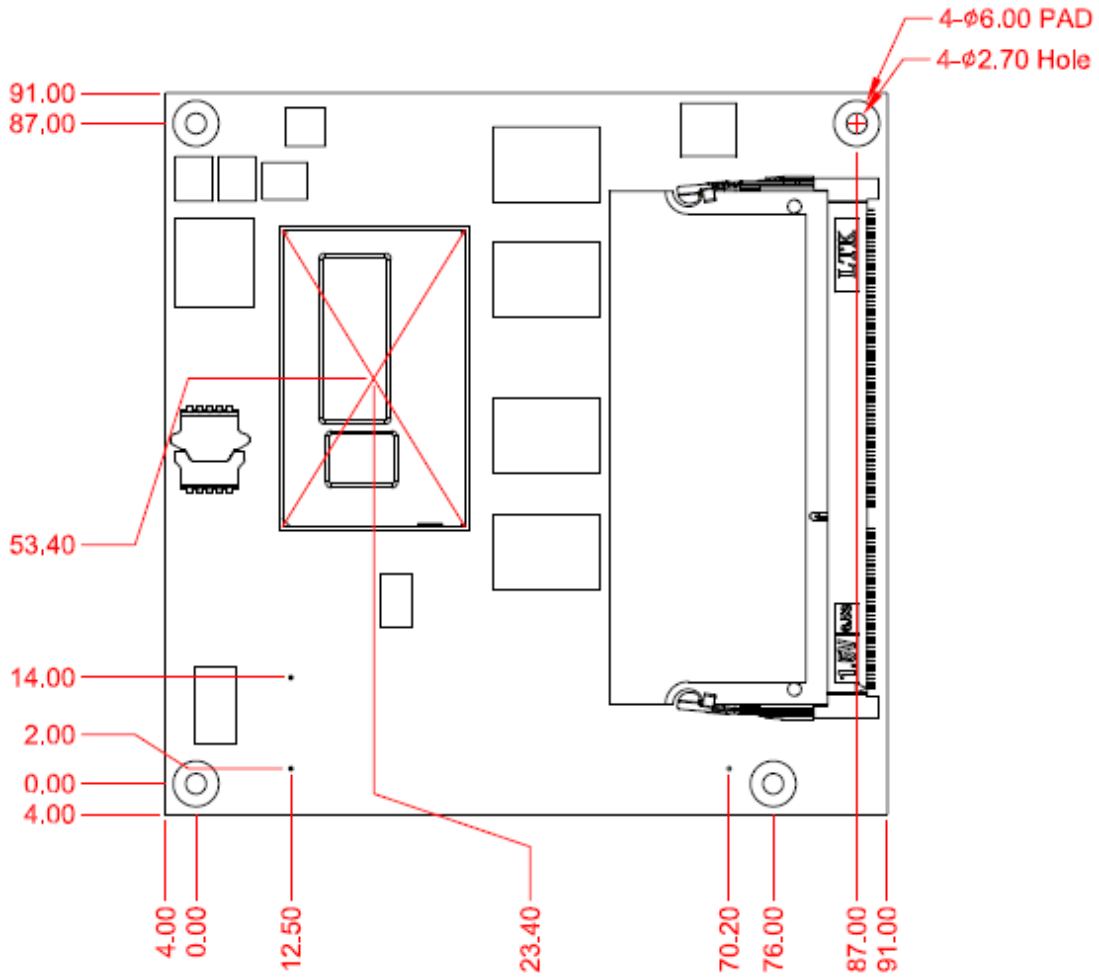
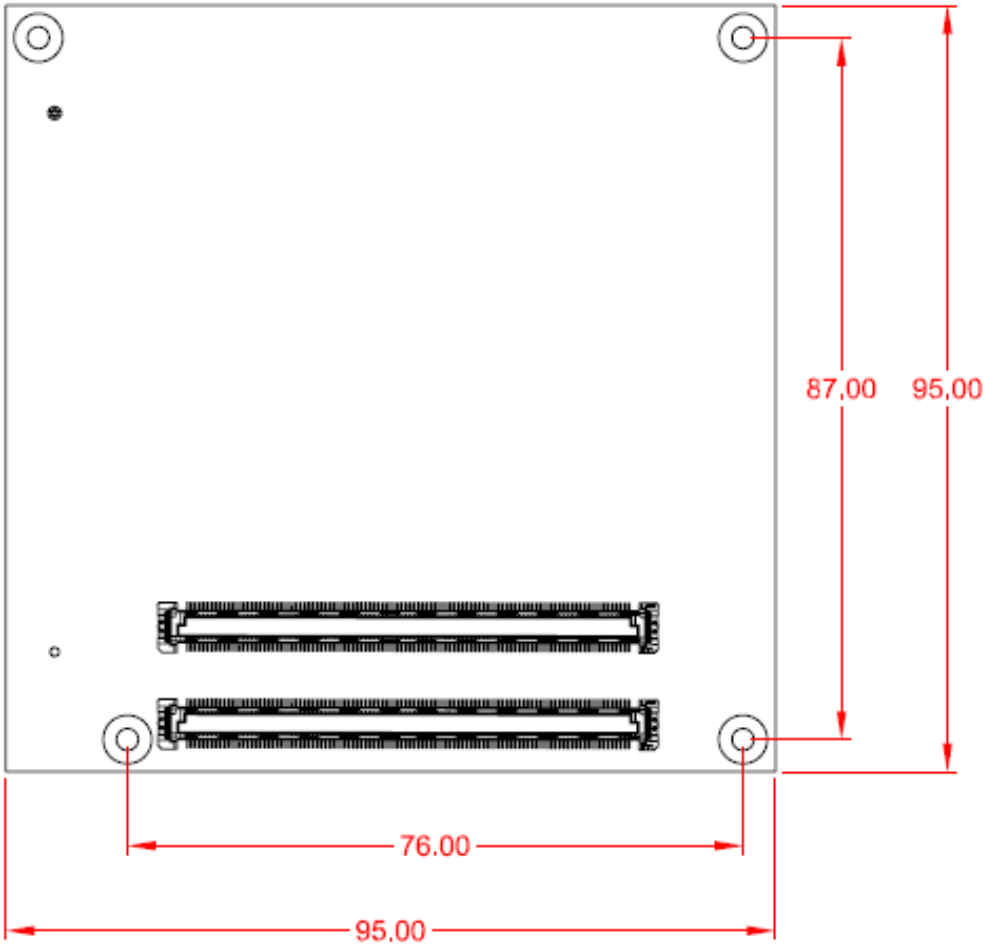
Chapter 2
Module and Pin Assignments

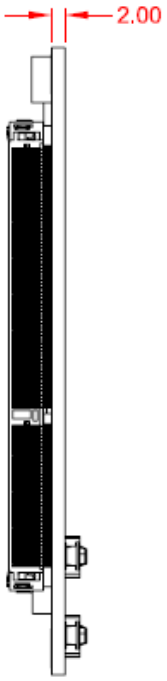
2.1 Module Dimensions and Fixing Holes



Top View

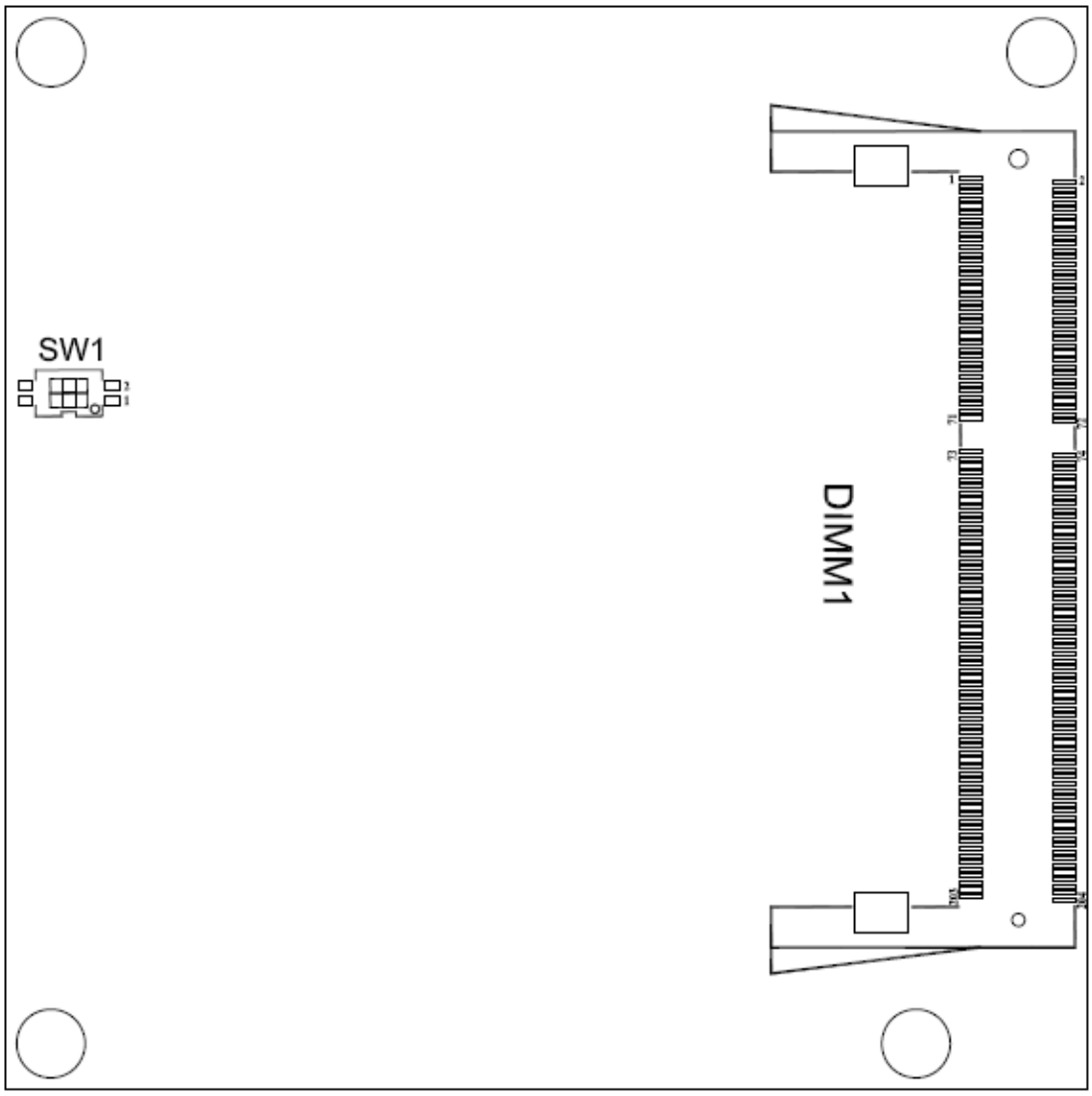


Bottom View

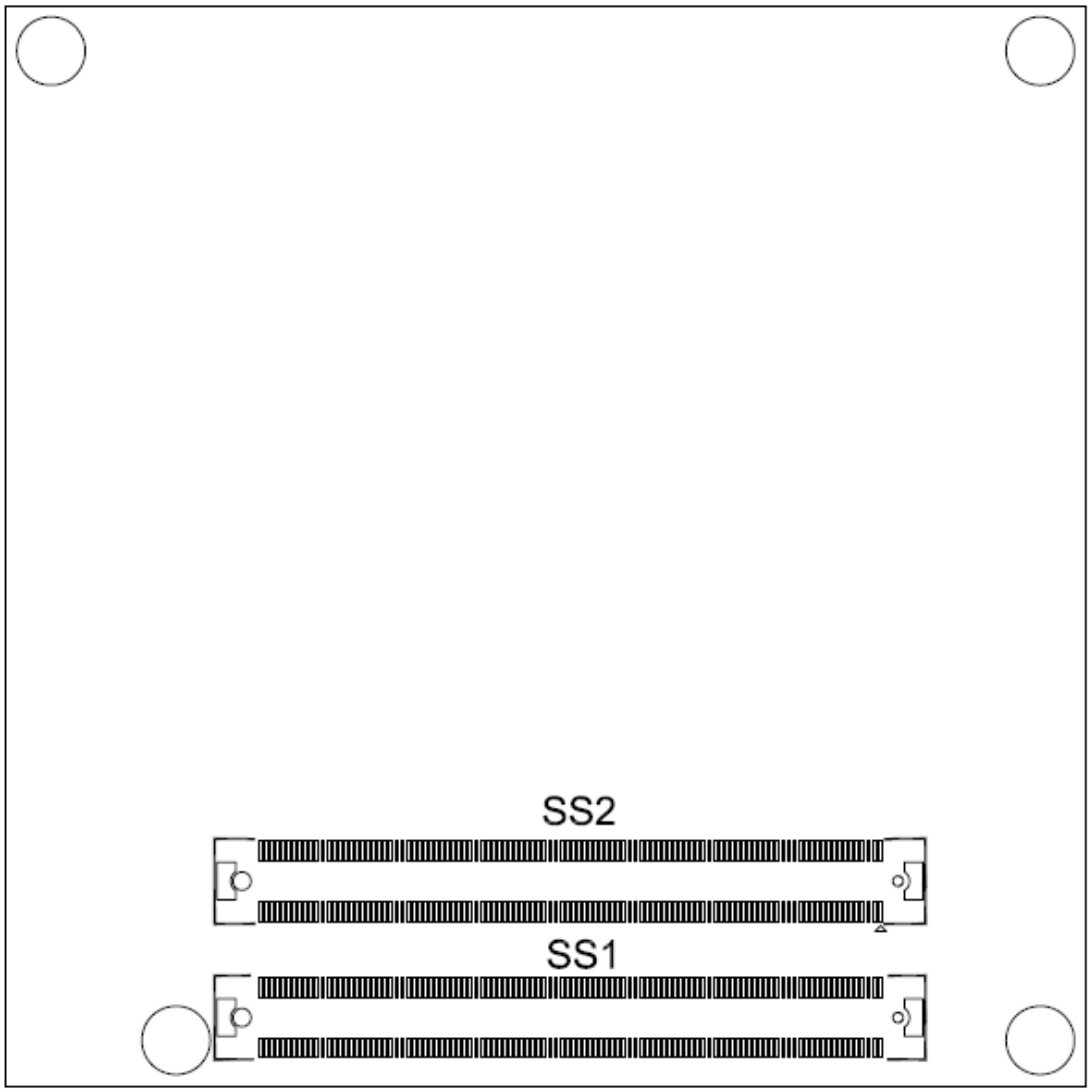


Side View

2.2 Module Layout



Top View



Bottom View

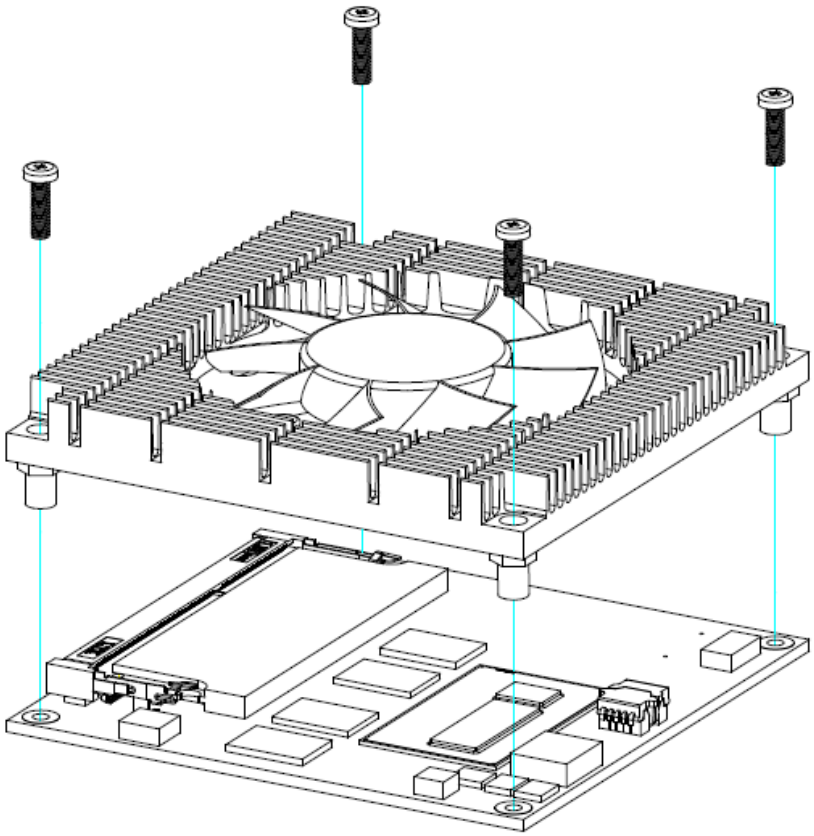
2.3 Installing Heatsink

For thermal dissipation, a heatsink enables the CEM881's components to dissipate heat efficiently. All heat generating components are thermally conducted to the heatsink in order to avoid hot spots. Below images illustrate how to install the heat spreader.

1. There is a protective plastic covering on the thermal pads. This must be removed before the heatsink can be mounted.

2. Each heatsink is designed for a specific CEM module. The thermal pads on the heatsink are designed to make contact with the necessary components on the CEM module. When mounting the heatsink you must make sure that the thermal pads on the heatsink make complete contact (no space between thermal pad and component) with the corresponding components on the CEM module. This is especially critical for CEM modules that have higher CPU speeds (for example 1.0GHz or more) to ensure that the heatsink acts as a proper thermal interface for cooling solutions.

3. This CPU module has four assembly holes for installing heatsink plate. Use the four screws to secure the heatsink plate to the CEM881. Be careful not to over-tighten the screws.



2.4 Switch Settings

Properly configure switch settings on the CEM881 to meet your application purpose. Below you can find a summary table of all switches and onboard default settings.

Note

Once the default switch setting needs to be changed, please do it under power-off condition.

Switch	Description	Setting
SW1	Auto Power On Default: Disable	SW1-1 ON
	Restore BIOS Optimal Defaults Default: Normal Operation	SW1-2 OFF

2.4.1 Auto Power On and Restore BIOS Optimal Defaults (SW1)

If dip1 of SW1 (SW1-1) is set to OFF position, the system will be automatically power on without pressing soft power button. If this jumper is set to ON position, it is necessary to manually press soft power button to power on the system.

The dip2 of SW1 (SW1-2) is for restoring BIOS default status. Flip SW1-2 to ON position for a few seconds then flip it back to OFF position. Doing this procedure can restore BIOS optimal defaults.

Function	Setting
Disable auto power on (Default)	SW1-1 ON
Enable auto power on	SW1-1 OFF
Normal operation (Default)	SW1-2 OFF
Restore BIOS optimal defaults	SW1-2 ON

SW1

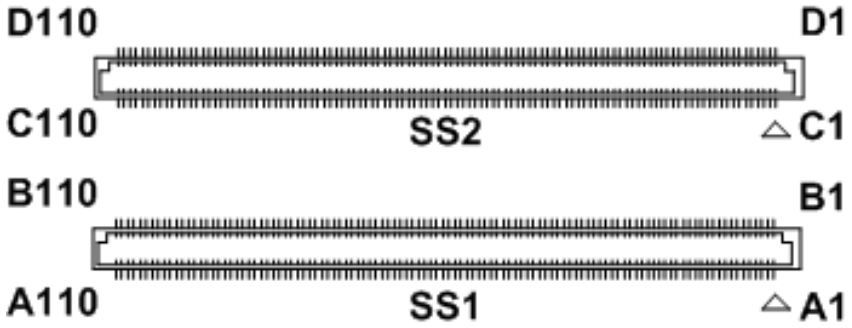
2.5 Connectors

Signals go to the other parts of the system through connectors. Loose or improper connection might cause problems, please make sure all connectors are properly and firmly connected. Here is a summary table which shows connectors on the hardware.

Connector	Description
DIMM1	DDR3L SO-DIMM Connector
SS1	COM Express™ Connector
SS2	COM Express™ Connector

2.5.1 COM Express™ Connectors (SS1 and SS2)

Below table shows the pin assignments for the 220-pin COM Express™ connectors.



Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
A1	GND (FIXED)	B1	GND (FIXED)	C1	GND (FIXED)	D1	GND (FIXED)
A2	GBE0_MDI3-	B2	GBE0_ACT#	C2	GND (FIXED)	D2	GND (FIXED)
A3	GBE0_MDI3+	B3	LPC_FRAME#	C3	USB_SSRX0-	D3	USB_SSTX0-
A4	GBE0_LINK100#	B4	LPC_AD0	C4	USB_SSRX0+	D4	USB_SSTX0+
A5	GBE0_LINK1000#	B5	LPC_AD1	C5	GND (FIXED)	D5	GND (FIXED)
A6	GBE0_MDI2-	B6	LPC_AD2	C6	USB_SSRX1-	D6	USB_SSTX1-
A7	GBE0_MDI2+	B7	LPC_AD3	C7	USB_SSRX1+	D7	USB_SSTX1+
A8	GBE0_LINK#	B8	N.C.	C8	GND (FIXED)	D8	GND (FIXED)
A9	GBE0_MDI1-	B9	N.C.	C9	N.C.	D9	N.C.
A10	GBE0_MDI1+	B10	LPC_CLK	C10	N.C.	D10	N.C.
A11	GND (FIXED)	B11	GND (FIXED)	C11	GND (FIXED)	D11	GND (FIXED)
A12	GBE0_MDI0-	B12	PWRBTN#	C12	N.C.	D12	N.C.
A13	GBE0_MDI0+	B13	SMB_CK	C13	N.C.	D13	N.C.
A14	GBE0_CTREF	B14	SMB_DAT	C14	GND (FIXED)	D14	GND (FIXED)
A15	SUS_S3#	B15	SMB_ALERT#	C15	N.C.	D15	DDI1_CTRLCLK_AUX+
A16	SATA0_TX+	B16	SATA1_TX+	C16	N.C.	D16	DDI1_CTRLDATA_AUX-
A17	SATA0_TX-	B17	SATA1_TX-	C17	N.C.	D17	N.C.
A18	SUS_S4#	B18	SUS_STAT#	C18	N.C.	D18	N.C.
A19	SATA0_RX+	B19	SATA1_RX+	C19	N.C.	D19	N.C.
A20	SATA0_RX-	B20	SATA1_RX-	C20	N.C.	D20	N.C.
A21	GND (FIXED)	B21	GND (FIXED)	C21	GND (FIXED)	D21	GND (FIXED)
A22	SATA2_TX+	B22	SATA3_TX+	C22	N.C.	D22	N.C.
A23	SATA2_TX-	B23	SATA3_TX-	C23	N.C.	D23	N.C.
A24	SUS_S5#	B24	PWR_OK	C24	DDI1_HPD	D24	N.C.
A25	SATA2_RX+	B25	SATA3_RX+	C25	N.C.	D25	N.C.
A26	SATA2_RX-	B26	SATA3_RX-	C26	N.C.	D26	DDI1_PAIR0+
A27	BATLOW#	B27	WDT	C27	N.C.	D27	DDI1_PAIR0-
A28	(S)ATA_ACT#	B28	N.C.	C28	N.C.	D28	N.C.
A29	AC/HDA_SYNC	B29	AC/HDA_SDIN1	C29	N.C.	D29	DDI1_PAIR1+
A30	AC/HDA_RST#	B30	AC/HDA_SDIN0	C30	N.C.	D30	DDI1_PAIR1-
A31	GND (FIXED)	B31	GND (FIXED)	C31	GND (FIXED)	D31	GND (FIXED)
A32	AC/HDA_BITCLK	B32	SPKR	C32	DDI2_CTRLCLK_AUX+	D32	DDI1_PAIR2+
A33	AC/HDA_SDOUT	B33	I2C_CK	C33	DDI2_CTRLDATA_AUX-	D33	DDI1_PAIR2-
A34	BIOS_DISABLE#	B34	I2C_DAT	C34	DDI2_DDC_AUX_SEL	D34	DDI1_DDC_AUX_SEL
A35	THRMTRIP#	B35	THRM#	C35	N.C.	D35	N.C.
A36	USB6-	B36	USB7-	C36	N.C.	D36	DDI1_PAIR3+
A37	USB6+	B37	USB7+	C37	N.C.	D37	DDI1_PAIR3-
A38	USB_6_7_OC#	B38	USB_4_5_OC#	C38	N.C.	D38	N.C.
A39	USB4-	B39	USB5-	C39	N.C.	D39	DDI2_PAIR0+
A40	USB4+	B40	USB5+	C40	N.C.	D40	DDI2_PAIR0-
A41	GND (FIXED)	B41	GND (FIXED)	C41	GND (FIXED)	D41	GND (FIXED)
A42	USB2-	B42	USB3-	C42	N.C.	D42	DDI2_PAIR1+
A43	USB2+	B43	USB3+	C43	N.C.	D43	DDI2_PAIR1-
A44	USB_2_3_OC#	B44	USB_0_1_OC#	C44	N.C.	D44	DDI2_HPD
A45	USB0-	B45	USB1-	C45	N.C.	D45	N.C.
A46	USB0+	B46	USB1+	C46	N.C.	D46	DDI2_PAIR2+
A47	VCC_RTC	B47	EXCD1_PERST#	C47	N.C.	D47	DDI2_PAIR2-
A48	EXCD0_PERST#	B48	EXCD1_CPPE#	C48	N.C.	D48	N.C.
A49	EXCD0_CPPE#	B49	SYS_RESET#	C49	N.C.	D49	DDI2_PAIR3+
A50	LPC_SERIRQ	B50	CB_RESET#	C50	N.C.	D50	DDI2_PAIR3-
A51	GND (FIXED)	B51	GND (FIXED)	C51	GND (FIXED)	D51	GND (FIXED)
A52	N.C.	B52	N.C.	C52	N.C.	D52	N.C.
A53	N.C.	B53	N.C.	C53	N.C.	D53	N.C.
A54	GPI0	B54	GPO1	C54	N.C.	D54	N.C.
A55	N.C.	B55	N.C.	C55	N.C.	D55	N.C.

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
A56	N.C.	B56	N.C.	C56	N.C.	D56	N.C.
A57	GND	B57	GPO2	C57	N.C.	D57	TYPE2#
A58	PCIE_TX3+	B58	PCIE_RX3+	C58	N.C.	D58	N.C.
A59	PCIE_TX3-	B59	PCIE_RX3-	C59	N.C.	D59	N.C.
A60	GND (FIXED)	B60	GND (FIXED)	C60	GND (FIXED)	D60	GND (FIXED)
A61	PCIE_TX2+	B61	PCIE_RX2+	C61	N.C.	D61	N.C.
A62	PCIE_TX2-	B62	PCIE_RX2-	C62	N.C.	D62	N.C.
A63	GPI1	B63	GPO3	C63	N.C.	D63	N.C.
A64	PCIE_TX1+	B64	PCIE_RX1+	C64	N.C.	D64	N.C.
A65	PCIE_TX1-	B65	PCIE_RX1-	C65	N.C.	D65	N.C.
A66	GND	B66	WAKE0#	C66	N.C.	D66	N.C.
A67	GPI2	B67	WAKE1#	C67	N.C.	D67	GND
A68	PCIE_TX0+	B68	PCIE_RX0+	C68	N.C.	D68	N.C.
A69	PCIE_TX0-	B69	PCIE_RX0-	C69	N.C.	D69	N.C.
A70	GND(FIXED)	B70	GND(FIXED)	C70	GND(FIXED)	D70	GND(FIXED)
A71	LVDS_A0+	B71	LVDS_B0+	C71	N.C.	D71	N.C.
A72	LVDS_A0-	B72	LVDS_B0-	C72	N.C.	D72	N.C.
A73	LVDS_A1+	B73	LVDS_B1+	C73	GND(FIXED)	D73	SDVO_CLK
A74	LVDS_A1-	B74	LVDS_B1-	C74	N.C.	D74	N.C.
A75	LVDS_A2+	B75	LVDS_B2+	C75	N.C.	D75	N.C.
A76	LVDS_A2-	B76	LVDS_B2-	C76	GND	D76	GND
A77	LVDS_VDD_EN	B77	LVDS_B3+	C77	N.C.	D77	N.C.
A78	LVDS_A3+	B78	LVDS_B3-	C78	N.C.	D78	N.C.
A79	LVDS_A3-	B79	LVDS_BKLT_EN	C79	N.C.	D79	N.C.
A80	GND(FIXED)	B80	GND(FIXED)	C80	GND(FIXED)	D80	GND(FIXED)
A81	LVDS_A_CK+	B81	LVDS_B_CK+	C81	N.C.	D81	N.C.
A82	LVDS_A_CK-	B82	LVDS_B_CK-	C82	N.C.	D82	N.C.
A83	LVDS_I2C_CK	B83	LVDS_BKLT_CTRL	C83	N.C.	D83	N.C.
A84	LVDS_I2C_DAT	B84	VCC_5V_SBY	C84	GND	D84	GND
A85	GPI3	B85	VCC_5V_SBY	C85	N.C.	D85	N.C.
A86	N.C.	B86	VCC_5V_SBY	C86	N.C.	D86	N.C.
A87	N.C.	B87	VCC_5V_SBY	C87	GND	D87	GND
A88	PCIE0_CK_REF+	B88	BIOS_DIS1	C88	N.C.	D88	N.C.
A89	PCIE0_CK_REF-	B89	N.C.	C89	N.C.	D89	N.C.
A90	GND (FIXED)	B90	GND (FIXED)	C90	GND (FIXED)	D90	GND (FIXED)
A91	SPI_POWER	B91	N.C.	C91	N.C.	D91	N.C.
A92	SPI_MISO	B92	N.C.	C92	N.C.	D92	N.C.
A93	GPO0	B93	N.C.	C93	GND	D93	GND
A94	SPI_CLK	B94	N.C.	C94	N.C.	D94	N.C.
A95	SPI_MOSI	B95	N.C.	C95	N.C.	D95	N.C.
A96	TPM_PP	B96	N.C.	C96	GND	D96	GND
A97	N.C.	B97	SPI_CS#	C97	N.C.	D97	N.C.
A98	SER0_TX	B98	N.C.	C98	N.C.	D98	N.C.
A99	SER0_RX	B99	N.C.	C99	N.C.	D99	N.C.
A100	GND (FIXED)	B100	GND (FIXED)	C100	GND (FIXED)	D100	GND (FIXED)
A101	SER1_TX	B101	FAN_PWMOUT	C101	N.C.	D101	N.C.
A102	SER1_RX	B102	FAN_TACHIN	C102	N.C.	D102	N.C.
A103	LID#	B103	SLEEP#	C103	GND	D103	GND
A104	VCC_12V	B104	VCC_12V	C104	VCC_12V	D104	VCC_12V
A105	VCC_12V	B105	VCC_12V	C105	VCC_12V	D105	VCC_12V
A106	VCC_12V	B106	VCC_12V	C106	VCC_12V	D106	VCC_12V
A107	VCC_12V	B107	VCC_12V	C107	VCC_12V	D107	VCC_12V
A108	VCC_12V	B108	VCC_12V	C108	VCC_12V	D108	VCC_12V
A109	VCC_12V	B109	VCC_12V	C109	VCC_12V	D109	VCC_12V
A110	GND (FIXED)	B110	GND (FIXED)	C110	GND (FIXED)	D110	GND (FIXED)

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Chapter 3
Hardware Description

3.1 Microprocessor

The CEM881 supports Intel® Core™ i7/ i5/ i3 and Celeron® processors, which enables your system to operate under Windows® 7, Windows® 8 and Linux environments. The system performance depends on the microprocessor. You must install the heatsink or cooler carefully and properly to prevent damage to your hardware.

3.2 BIOS

The CEM881 uses AMI Plug and Play BIOS with a single 64Mbit SPI Flash.

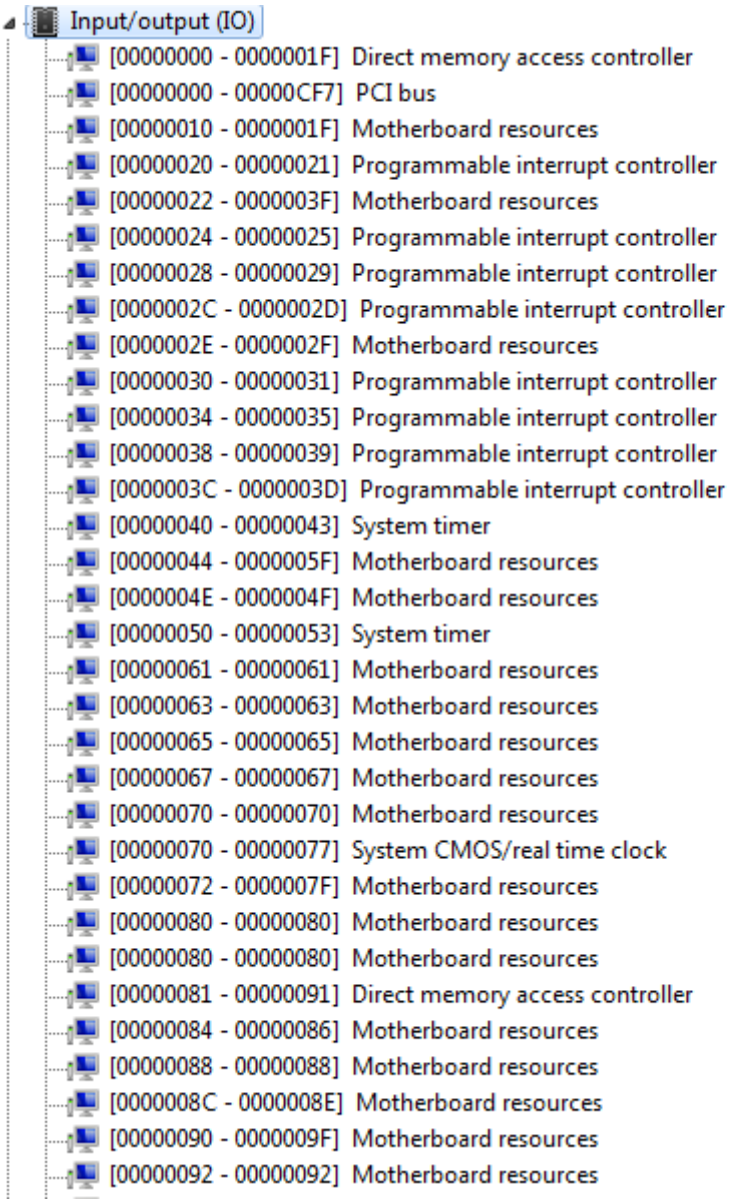
3.3 System Memory

The CEM881 supports one 204-pin DDR3L 1333/1066MHz SO-DIMM socket for maximum memory capacity up to 8GB and one onboard DDR3L memory which maximum capacity can be up to 4GB (optional). The memory module can come in sizes of 1GB, 2GB, 4GB and 8GB.

3.4 I/O Port Address Map

The Intel® Core™ i7/ i5/ i3 and Celeron® processors communicate via I/O ports. Total 1KB port addresses are available for assigning to other devices via I/O expansion cards.

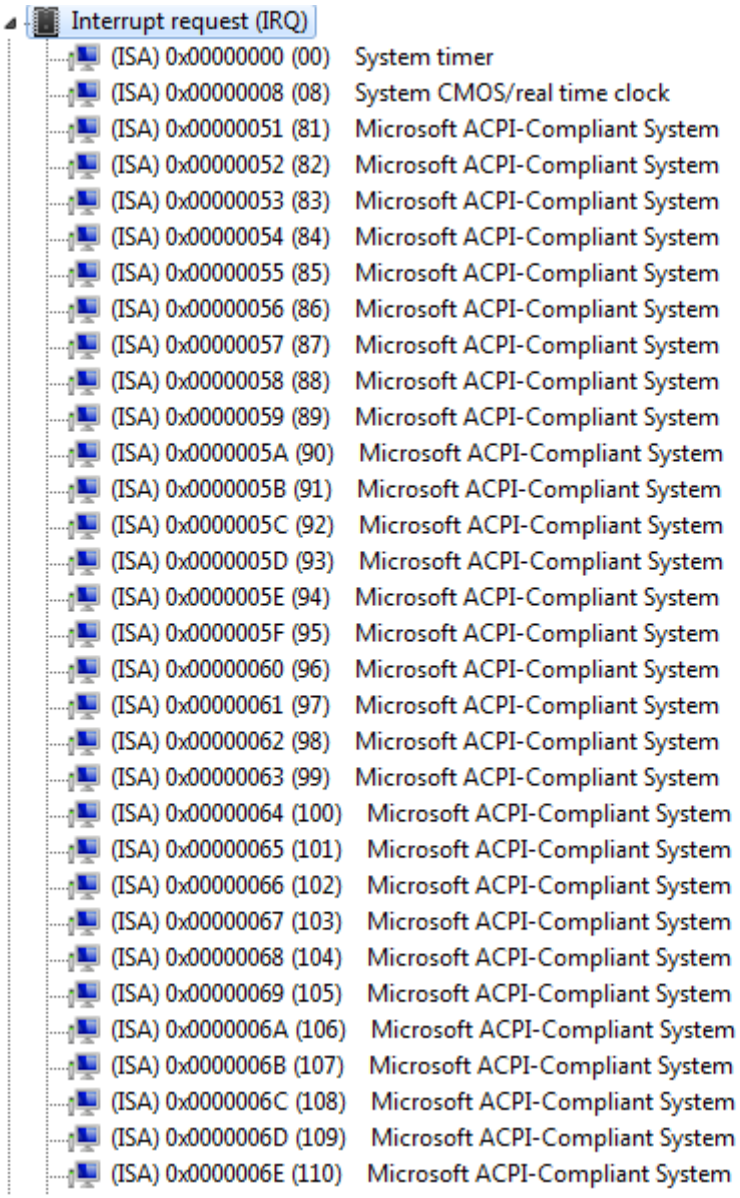
The I/O port addresses (with CEB94006 baseboard under Windows® 7) are as follows:

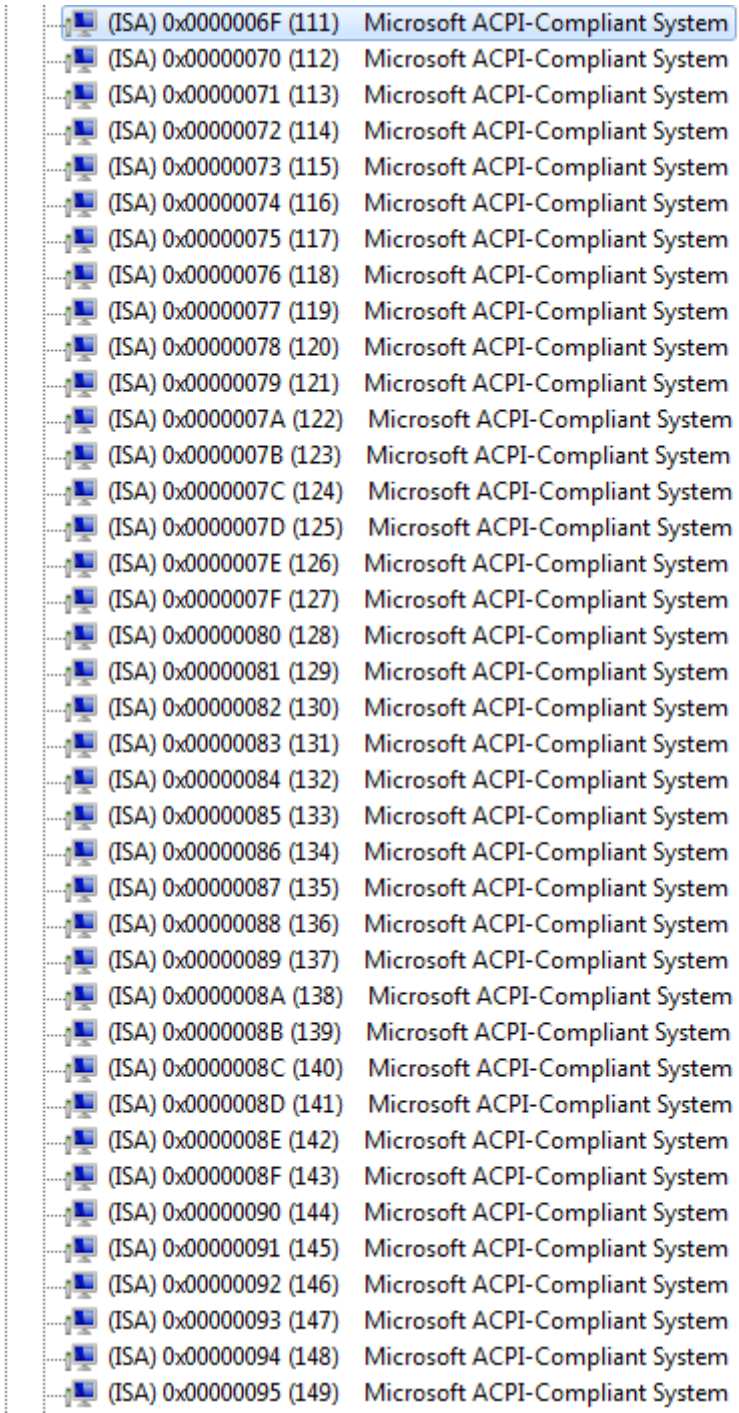

Input/output (IO)
[00000000 - 0000001F] Direct memory access controller
[00000000 - 00000CF7] PCI bus
[00000010 - 0000001F] Motherboard resources
[00000020 - 00000021] Programmable interrupt controller
[00000022 - 0000003F] Motherboard resources
[00000024 - 00000025] Programmable interrupt controller
[00000028 - 00000029] Programmable interrupt controller
[0000002C - 0000002D] Programmable interrupt controller
[0000002E - 0000002F] Motherboard resources
[00000030 - 00000031] Programmable interrupt controller
[00000034 - 00000035] Programmable interrupt controller
[00000038 - 00000039] Programmable interrupt controller
[0000003C - 0000003D] Programmable interrupt controller
[00000040 - 00000043] System timer
[00000044 - 0000005F] Motherboard resources
[0000004E - 0000004F] Motherboard resources
[00000050 - 00000053] System timer
[00000061 - 00000061] Motherboard resources
[00000063 - 00000063] Motherboard resources
[00000065 - 00000065] Motherboard resources
[00000067 - 00000067] Motherboard resources
[00000070 - 00000070] Motherboard resources
[00000070 - 00000077] System CMOS/real time clock
[00000072 - 0000007F] Motherboard resources
[00000080 - 00000080] Motherboard resources
[00000080 - 00000080] Motherboard resources
[00000081 - 00000091] Direct memory access controller
[00000084 - 00000086] Motherboard resources
[00000088 - 00000088] Motherboard resources
[0000008C - 0000008E] Motherboard resources
[00000090 - 0000009F] Motherboard resources
[00000092 - 00000092] Motherboard resources

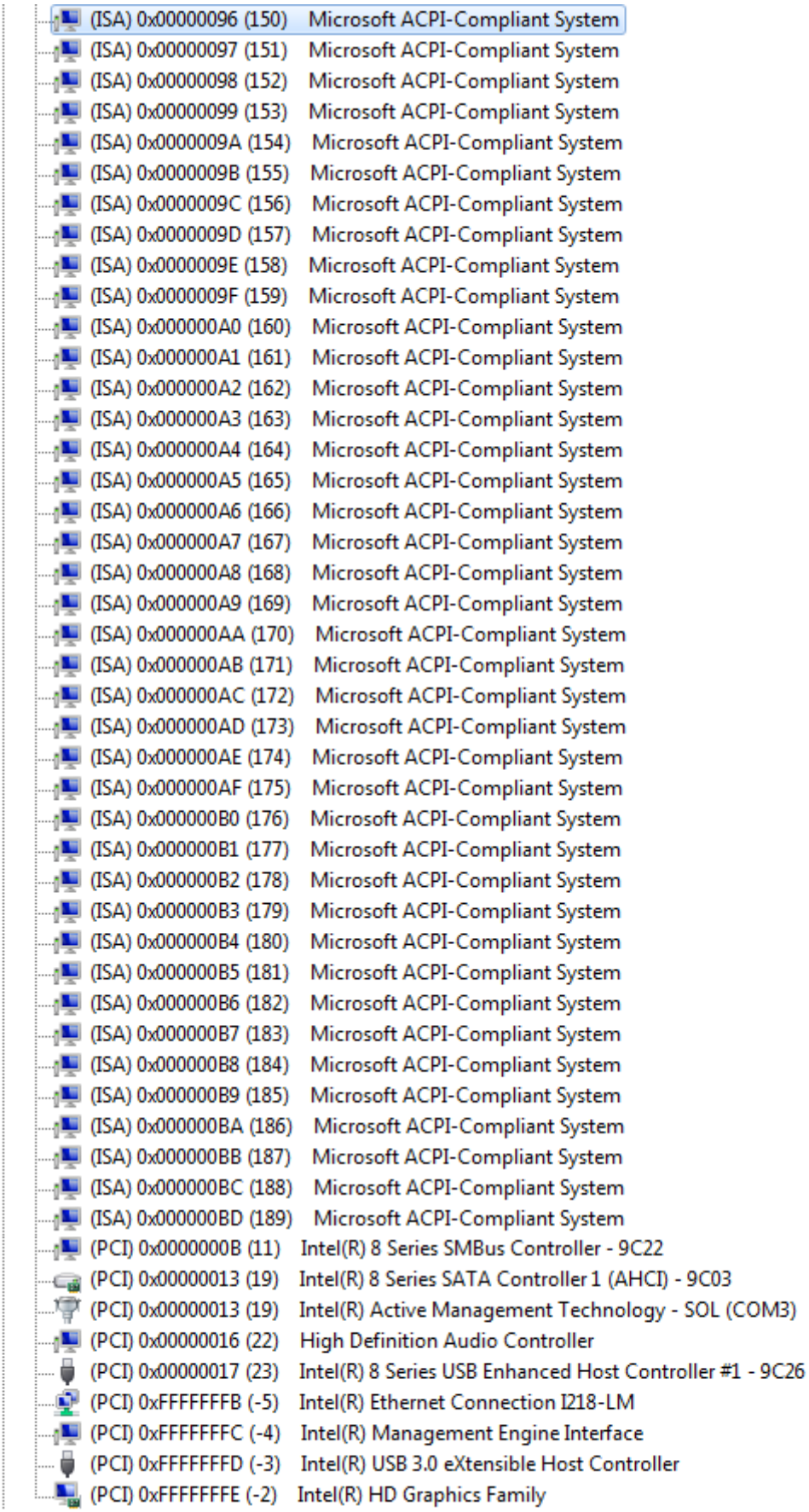
- [00000093 - 0000009F] Direct memory access controller
- [000000A0 - 000000A1] Programmable interrupt controller
- [000000A2 - 000000BF] Motherboard resources
- [000000A4 - 000000A5] Programmable interrupt controller
- [000000A8 - 000000A9] Programmable interrupt controller
- [000000AC - 000000AD] Programmable interrupt controller
- [000000B0 - 000000B1] Programmable interrupt controller
- [000000B2 - 000000B3] Motherboard resources
- [000000B4 - 000000B5] Programmable interrupt controller
- [000000B8 - 000000B9] Programmable interrupt controller
- [000000BC - 000000BD] Programmable interrupt controller
- [000000C0 - 000000DF] Direct memory access controller
- [000000E0 - 000000EF] Motherboard resources
- [000003B0 - 000003BB] Intel(R) HD Graphics Family
- [000003C0 - 000003DF] Intel(R) HD Graphics Family
- [000004D0 - 000004D1] Motherboard resources
- [000004D0 - 000004D1] Programmable interrupt controller
- [00000680 - 0000069F] Motherboard resources
- [00000A00 - 00000A0F] Motherboard resources
- [00000A10 - 00000A1F] Motherboard resources
- [00000A20 - 00000A3F] Motherboard resources
- [00000D00 - 0000FFFF] PCI bus
- [0000164E - 0000164F] Motherboard resources
- [00001800 - 000018FE] Motherboard resources
- [00001854 - 00001857] Motherboard resources
- [00001C00 - 00001CFE] Motherboard resources
- [00001D00 - 00001DFE] Motherboard resources
- [00001E00 - 00001EFE] Motherboard resources
- [00001F00 - 00001FFE] Motherboard resources
- [0000F000 - 0000F03F] Intel(R) HD Graphics Family
- [0000F040 - 0000F05F] Intel(R) 8 Series SMBus Controller - 9C22
- [0000F060 - 0000F07F] Intel(R) 8 Series SATA Controller 1 (AHCI) - 9C03
- [0000F0A0 - 0000F0A3] Intel(R) 8 Series SATA Controller 1 (AHCI) - 9C03
- [0000F0B0 - 0000F0B7] Intel(R) 8 Series SATA Controller 1 (AHCI) - 9C03
- [0000F0C0 - 0000F0C3] Intel(R) 8 Series SATA Controller 1 (AHCI) - 9C03
- [0000F0D0 - 0000F0D7] Intel(R) 8 Series SATA Controller 1 (AHCI) - 9C03
- [0000F0E0 - 0000F0E7] Intel(R) Active Management Technology - SOL (COM3)
- [0000FFFF - 0000FFFF] Motherboard resources
- [0000FFFF - 0000FFFF] Motherboard resources
- [0000FFFF - 0000FFFF] Motherboard resources

3.5 Interrupt Controller (IRQ) Map

The interrupt controller (IRQ) mapping list (with CEB94006 baseboard under Windows® 7) is shown as follows:

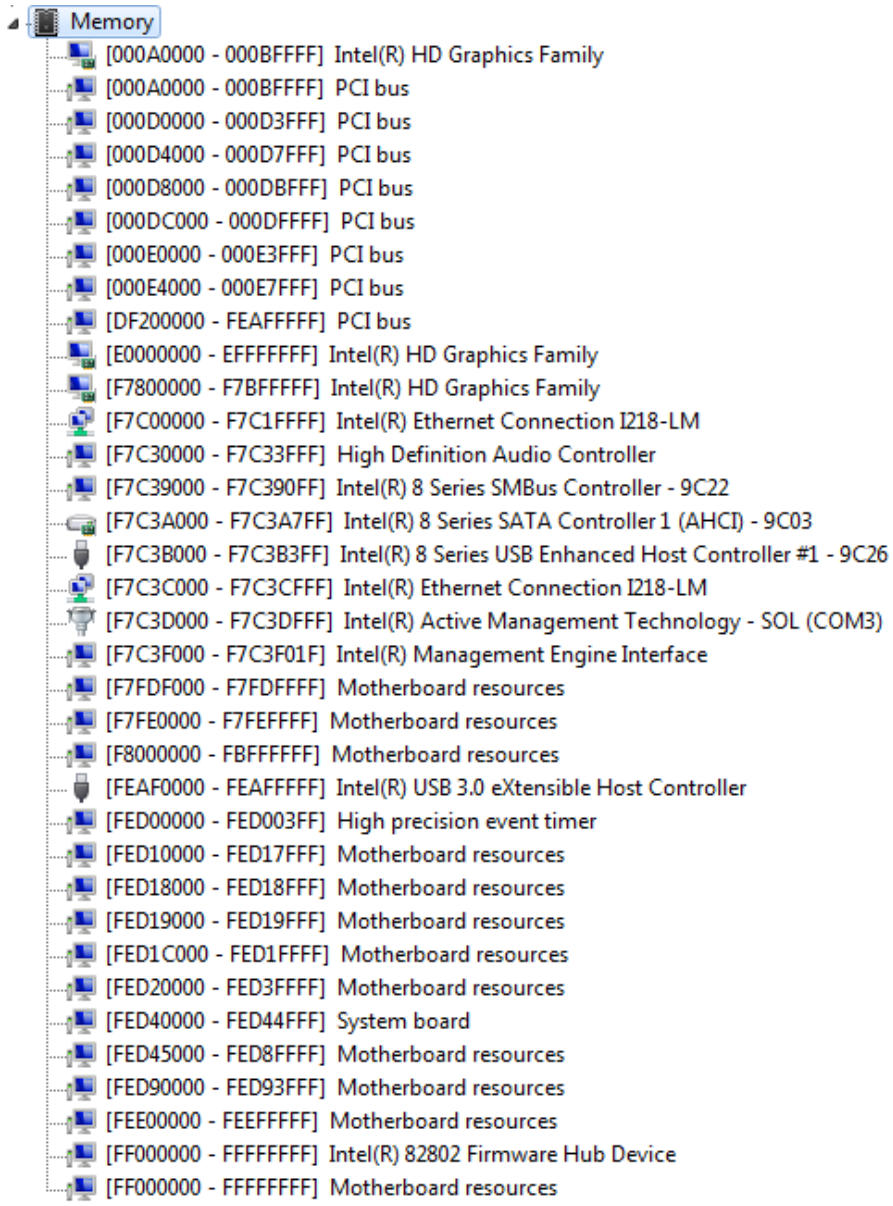

Interrupt request (IRQ)
(ISA) 0x00000000 (00) System timer
(ISA) 0x00000008 (08) System CMOS/real time clock
(ISA) 0x00000051 (81) Microsoft ACPI-Compliant System
(ISA) 0x00000052 (82) Microsoft ACPI-Compliant System
(ISA) 0x00000053 (83) Microsoft ACPI-Compliant System
(ISA) 0x00000054 (84) Microsoft ACPI-Compliant System
(ISA) 0x00000055 (85) Microsoft ACPI-Compliant System
(ISA) 0x00000056 (86) Microsoft ACPI-Compliant System
(ISA) 0x00000057 (87) Microsoft ACPI-Compliant System
(ISA) 0x00000058 (88) Microsoft ACPI-Compliant System
(ISA) 0x00000059 (89) Microsoft ACPI-Compliant System
(ISA) 0x0000005A (90) Microsoft ACPI-Compliant System
(ISA) 0x0000005B (91) Microsoft ACPI-Compliant System
(ISA) 0x0000005C (92) Microsoft ACPI-Compliant System
(ISA) 0x0000005D (93) Microsoft ACPI-Compliant System
(ISA) 0x0000005E (94) Microsoft ACPI-Compliant System
(ISA) 0x0000005F (95) Microsoft ACPI-Compliant System
(ISA) 0x00000060 (96) Microsoft ACPI-Compliant System
(ISA) 0x00000061 (97) Microsoft ACPI-Compliant System
(ISA) 0x00000062 (98) Microsoft ACPI-Compliant System
(ISA) 0x00000063 (99) Microsoft ACPI-Compliant System
(ISA) 0x00000064 (100) Microsoft ACPI-Compliant System
(ISA) 0x00000065 (101) Microsoft ACPI-Compliant System
(ISA) 0x00000066 (102) Microsoft ACPI-Compliant System
(ISA) 0x00000067 (103) Microsoft ACPI-Compliant System
(ISA) 0x00000068 (104) Microsoft ACPI-Compliant System
(ISA) 0x00000069 (105) Microsoft ACPI-Compliant System
(ISA) 0x0000006A (106) Microsoft ACPI-Compliant System
(ISA) 0x0000006B (107) Microsoft ACPI-Compliant System
(ISA) 0x0000006C (108) Microsoft ACPI-Compliant System
(ISA) 0x0000006D (109) Microsoft ACPI-Compliant System
(ISA) 0x0000006E (110) Microsoft ACPI-Compliant System


(ISA) 0x0000006F (111) Microsoft ACPI-Compliant System
(ISA) 0x00000070 (112) Microsoft ACPI-Compliant System
(ISA) 0x00000071 (113) Microsoft ACPI-Compliant System
(ISA) 0x00000072 (114) Microsoft ACPI-Compliant System
(ISA) 0x00000073 (115) Microsoft ACPI-Compliant System
(ISA) 0x00000074 (116) Microsoft ACPI-Compliant System
(ISA) 0x00000075 (117) Microsoft ACPI-Compliant System
(ISA) 0x00000076 (118) Microsoft ACPI-Compliant System
(ISA) 0x00000077 (119) Microsoft ACPI-Compliant System
(ISA) 0x00000078 (120) Microsoft ACPI-Compliant System
(ISA) 0x00000079 (121) Microsoft ACPI-Compliant System
(ISA) 0x0000007A (122) Microsoft ACPI-Compliant System
(ISA) 0x0000007B (123) Microsoft ACPI-Compliant System
(ISA) 0x0000007C (124) Microsoft ACPI-Compliant System
(ISA) 0x0000007D (125) Microsoft ACPI-Compliant System
(ISA) 0x0000007E (126) Microsoft ACPI-Compliant System
(ISA) 0x0000007F (127) Microsoft ACPI-Compliant System
(ISA) 0x00000080 (128) Microsoft ACPI-Compliant System
(ISA) 0x00000081 (129) Microsoft ACPI-Compliant System
(ISA) 0x00000082 (130) Microsoft ACPI-Compliant System
(ISA) 0x00000083 (131) Microsoft ACPI-Compliant System
(ISA) 0x00000084 (132) Microsoft ACPI-Compliant System
(ISA) 0x00000085 (133) Microsoft ACPI-Compliant System
(ISA) 0x00000086 (134) Microsoft ACPI-Compliant System
(ISA) 0x00000087 (135) Microsoft ACPI-Compliant System
(ISA) 0x00000088 (136) Microsoft ACPI-Compliant System
(ISA) 0x00000089 (137) Microsoft ACPI-Compliant System
(ISA) 0x0000008A (138) Microsoft ACPI-Compliant System
(ISA) 0x0000008B (139) Microsoft ACPI-Compliant System
(ISA) 0x0000008C (140) Microsoft ACPI-Compliant System
(ISA) 0x0000008D (141) Microsoft ACPI-Compliant System
(ISA) 0x0000008E (142) Microsoft ACPI-Compliant System
(ISA) 0x0000008F (143) Microsoft ACPI-Compliant System
(ISA) 0x00000090 (144) Microsoft ACPI-Compliant System
(ISA) 0x00000091 (145) Microsoft ACPI-Compliant System
(ISA) 0x00000092 (146) Microsoft ACPI-Compliant System
(ISA) 0x00000093 (147) Microsoft ACPI-Compliant System
(ISA) 0x00000094 (148) Microsoft ACPI-Compliant System
(ISA) 0x00000095 (149) Microsoft ACPI-Compliant System


(ISA) 0x00000096 (150) Microsoft ACPI-Compliant System
(ISA) 0x00000097 (151) Microsoft ACPI-Compliant System
(ISA) 0x00000098 (152) Microsoft ACPI-Compliant System
(ISA) 0x00000099 (153) Microsoft ACPI-Compliant System
(ISA) 0x0000009A (154) Microsoft ACPI-Compliant System
(ISA) 0x0000009B (155) Microsoft ACPI-Compliant System
(ISA) 0x0000009C (156) Microsoft ACPI-Compliant System
(ISA) 0x0000009D (157) Microsoft ACPI-Compliant System
(ISA) 0x0000009E (158) Microsoft ACPI-Compliant System
(ISA) 0x0000009F (159) Microsoft ACPI-Compliant System
(ISA) 0x000000A0 (160) Microsoft ACPI-Compliant System
(ISA) 0x000000A1 (161) Microsoft ACPI-Compliant System
(ISA) 0x000000A2 (162) Microsoft ACPI-Compliant System
(ISA) 0x000000A3 (163) Microsoft ACPI-Compliant System
(ISA) 0x000000A4 (164) Microsoft ACPI-Compliant System
(ISA) 0x000000A5 (165) Microsoft ACPI-Compliant System
(ISA) 0x000000A6 (166) Microsoft ACPI-Compliant System
(ISA) 0x000000A7 (167) Microsoft ACPI-Compliant System
(ISA) 0x000000A8 (168) Microsoft ACPI-Compliant System
(ISA) 0x000000A9 (169) Microsoft ACPI-Compliant System
(ISA) 0x000000AA (170) Microsoft ACPI-Compliant System
(ISA) 0x000000AB (171) Microsoft ACPI-Compliant System
(ISA) 0x000000AC (172) Microsoft ACPI-Compliant System
(ISA) 0x000000AD (173) Microsoft ACPI-Compliant System
(ISA) 0x000000AE (174) Microsoft ACPI-Compliant System
(ISA) 0x000000AF (175) Microsoft ACPI-Compliant System
(ISA) 0x000000B0 (176) Microsoft ACPI-Compliant System
(ISA) 0x000000B1 (177) Microsoft ACPI-Compliant System
(ISA) 0x000000B2 (178) Microsoft ACPI-Compliant System
(ISA) 0x000000B3 (179) Microsoft ACPI-Compliant System
(ISA) 0x000000B4 (180) Microsoft ACPI-Compliant System
(ISA) 0x000000B5 (181) Microsoft ACPI-Compliant System
(ISA) 0x000000B6 (182) Microsoft ACPI-Compliant System
(ISA) 0x000000B7 (183) Microsoft ACPI-Compliant System
(ISA) 0x000000B8 (184) Microsoft ACPI-Compliant System
(ISA) 0x000000B9 (185) Microsoft ACPI-Compliant System
(ISA) 0x000000BA (186) Microsoft ACPI-Compliant System
(ISA) 0x000000BB (187) Microsoft ACPI-Compliant System
(ISA) 0x000000BC (188) Microsoft ACPI-Compliant System
(ISA) 0x000000BD (189) Microsoft ACPI-Compliant System
(PCI) 0x0000000B (11) Intel(R) 8 Series SMBus Controller - 9C22
(PCI) 0x00000013 (19) Intel(R) 8 Series SATA Controller 1 (AHCI) - 9C03
(PCI) 0x00000013 (19) Intel(R) Active Management Technology - SOL (COM3)
(PCI) 0x00000016 (22) High Definition Audio Controller
(PCI) 0x00000017 (23) Intel(R) 8 Series USB Enhanced Host Controller #1 - 9C26
(PCI) 0xFFFFFFFB (-5) Intel(R) Ethernet Connection I218-LM
(PCI) 0xFFFFFFFC (-4) Intel(R) Management Engine Interface
(PCI) 0xFFFFFFFD (-3) Intel(R) USB 3.0 eXtensible Host Controller
(PCI) 0xFFFFFFFE (-2) Intel(R) HD Graphics Family

3.6 Memory Map

The memory (with CEB94006 baseboard under Windows® 7) mapping list is shown as follows:


Memory
[000A0000 - 000BFFFF] Intel(R) HD Graphics Family
[000A0000 - 000BFFFF] PCI bus
[000D0000 - 000D3FFF] PCI bus
[000D4000 - 000D7FFF] PCI bus
[000D8000 - 000DBFFF] PCI bus
[000DC000 - 000DFFFF] PCI bus
[000E0000 - 000E3FFF] PCI bus
[000E4000 - 000E7FFF] PCI bus
[DF200000 - FEAFFFFF] PCI bus
[E0000000 - EFFFFFFF] Intel(R) HD Graphics Family
[F7800000 - F7BFFFFF] Intel(R) HD Graphics Family
[F7C00000 - F7C1FFFF] Intel(R) Ethernet Connection I218-LM
[F7C30000 - F7C33FFF] High Definition Audio Controller
[F7C39000 - F7C390FF] Intel(R) 8 Series SMBus Controller - 9C22
[F7C3A000 - F7C3A7FF] Intel(R) 8 Series SATA Controller 1 (AHCI) - 9C03
[F7C3B000 - F7C3B3FF] Intel(R) 8 Series USB Enhanced Host Controller #1 - 9C26
[F7C3C000 - F7C3CFFF] Intel(R) Ethernet Connection I218-LM
[F7C3D000 - F7C3DFFF] Intel(R) Active Management Technology - SOL (COM3)
[F7C3F000 - F7C3F01F] Intel(R) Management Engine Interface
[F7FDF000 - F7FDFFFF] Motherboard resources
[F7FE0000 - F7FEFFFF] Motherboard resources
[F8000000 - FBFFFFFF] Motherboard resources
[FEAF0000 - FEAFFFFF] Intel(R) USB 3.0 eXtensible Host Controller
[FED00000 - FED003FF] High precision event timer
[FED10000 - FED17FFF] Motherboard resources
[FED18000 - FED18FFF] Motherboard resources
[FED19000 - FED19FFF] Motherboard resources
[FED1C000 - FED1FFFF] Motherboard resources
[FED20000 - FED3FFFF] Motherboard resources
[FED40000 - FED44FFF] System board
[FED45000 - FED8FFFF] Motherboard resources
[FED90000 - FED93FFF] Motherboard resources
[FEE00000 - FEEFFFFF] Motherboard resources
[FF000000 - FFFFFFFF] Intel(R) 82802 Firmware Hub Device
[FF000000 - FFFFFFFF] Motherboard resources

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Chapter 4
AMI BIOS Setup Utility

The AMI UEFI BIOS provides users with a built-in setup program to modify basic system configuration. All configured parameters are stored in a flash chip to save the setup information whenever the power is turned off. This chapter provides users with detailed description about how to set up basic system configuration through the AMI BIOS setup utility.

4.1 Starting

To enter the setup screens, follow the steps below:

1. Turn on the computer and press the <Del> key immediately.
2. After you press the <Del> key, the main BIOS setup menu displays. You can access the other setup screens from the main BIOS setup menu, such as the Advanced and Chipset menus.

Note

If your computer cannot boot after making and saving system changes with BIOS setup, you can restore BIOS optimal defaults by setting SW1-2 (see section 2.4.1).

It is strongly recommended that you should avoid changing the chipset's defaults. Both AMI and your system manufacturer have carefully set up these defaults that provide the best performance and reliability.

4.2 Navigation Keys

The BIOS setup/utility uses a key-based navigation system called hot keys. Most of the BIOS setup utility hot keys can be used at any time during the setup navigation process. These keys include <F1>, <F2>, <Enter>, <ESC>, <Arrow> keys, and so on.

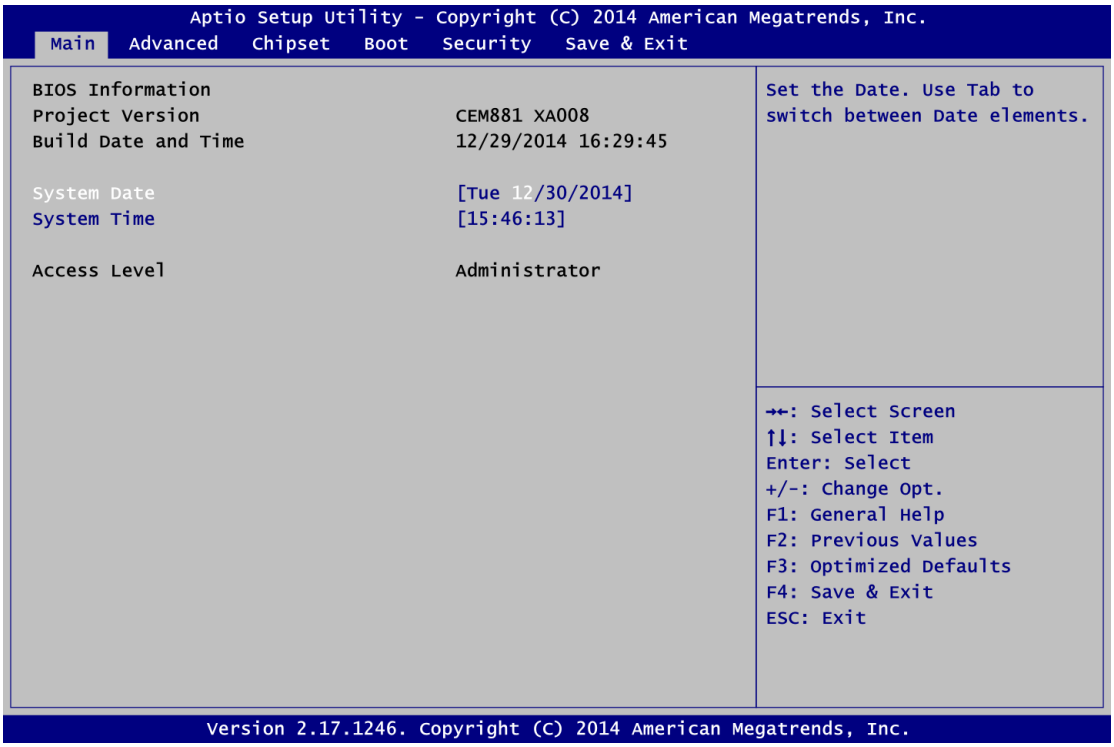
Note

Some of the navigation keys differ from one screen to another.

Hot Keys	Description
→← Left/Right	The Left and Right <Arrow> keys allow you to select a setup screen.
↑↓ Up/Down	The Up and Down <Arrow> keys allow you to select a setup screen or sub-screen.
+– Plus/Minus	The Plus and Minus <Arrow> keys allow you to change the field value of a particular setup item.
Tab	The <Tab> key allows you to select setup fields.
F1	The <F1> key allows you to display the General Help screen.
F2	The <F2> key allows you to Load Previous Values.
F3	The <F3> key allows you to Load Optimized Defaults.
F4	The <F4> key allows you to save any changes you have made and exit Setup. Press the <F4> key to save your changes.
Esc	The <Esc> key allows you to discard any changes you have made and exit the Setup. Press the <Esc> key to exit the setup without saving your changes.
Enter	The <Enter> key allows you to display or change the setup option listed for a particular setup item. The <Enter> key can also allow you to display the setup sub-screens.

4.3 Main Menu

When you first enter the setup utility, you will enter the Main setup screen. You can always return to the Main setup screen by selecting the Main tab. System Time/Date can be set up as described below. The Main BIOS setup screen is shown below.



BIOS Information
Display BIOS information.

System Date/Time
Use this option to change the system time and date. Highlight System Time or System Date using the <Arrow> keys. Enter new values through the keyboard. Press the <Tab> key or the <Arrow> keys to move between fields. The date must be entered in MM/DD/YY format. The time is entered in HH:MM:SS format.

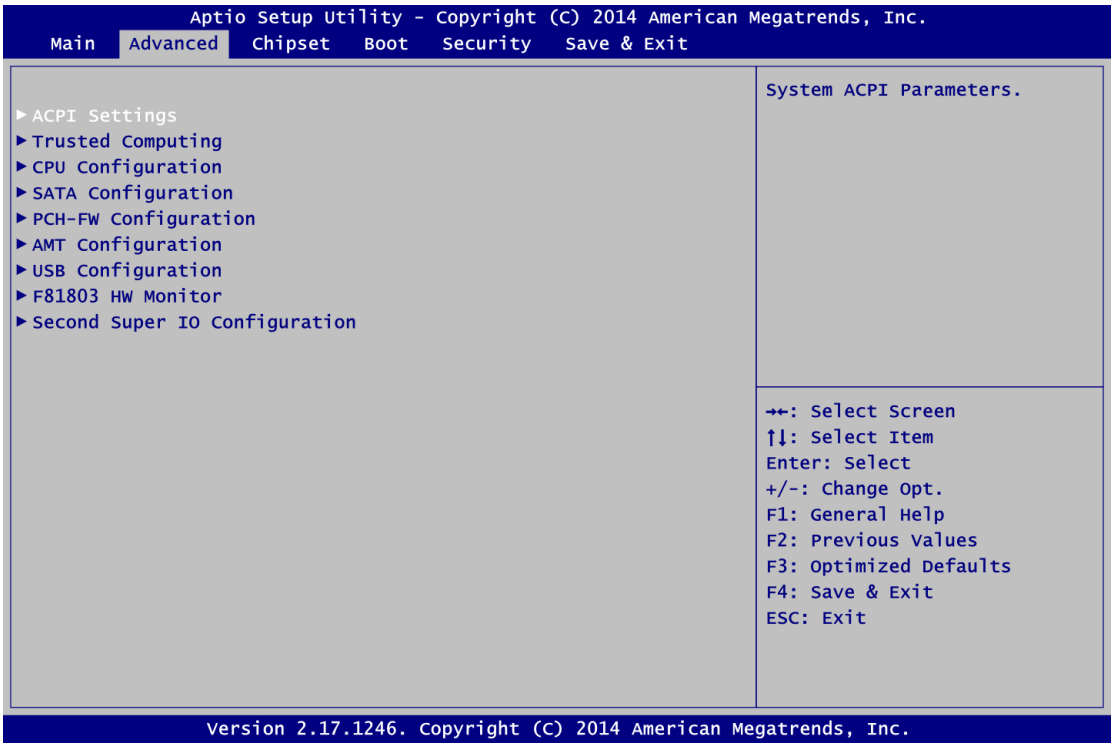
Access Level
Display the access level of current user.

4.4 Advanced Menu

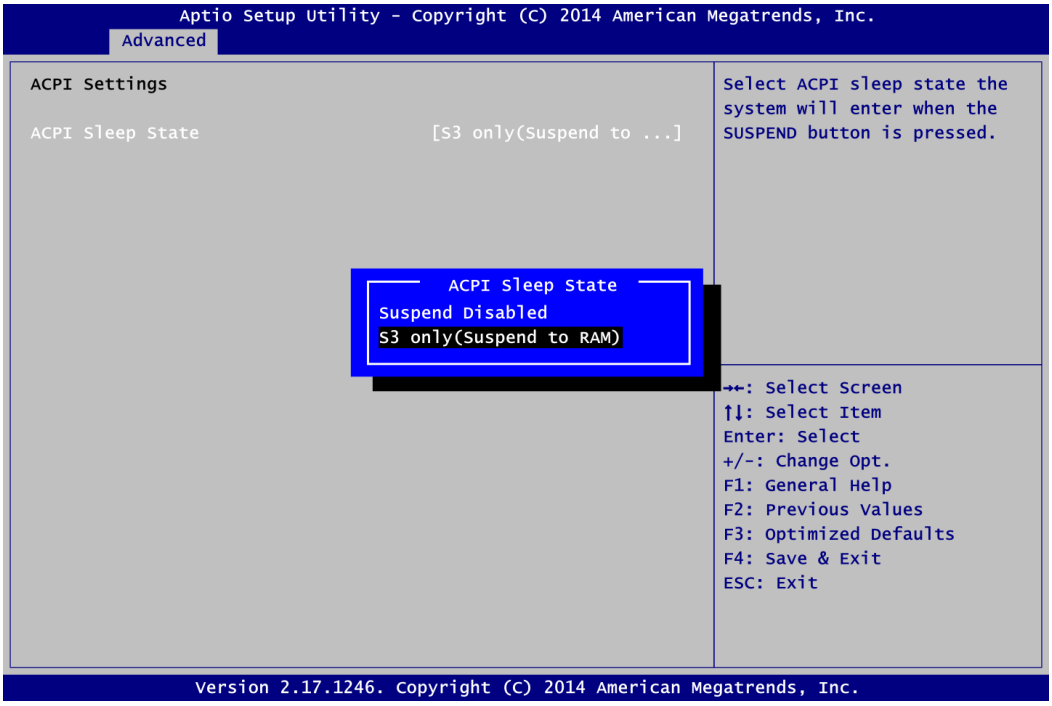
The Advanced menu also allows users to set configuration of the CPU and other system devices. You can select any of the items in the left frame of the screen to go to the sub menus:

- ▶ ACPI Settings
- ▶ Trusted Computing
- ▶ CPU Configuration
- ▶ SATA Configuration
- ▶ PCH-FW Configuration
- ▶ AMT Configuration
- ▶ USB Configuration
- ▶ F81803 HW Monitor
- ▶ Second Super IO Configuration

For items marked with "▶", please press <Enter> for more options.

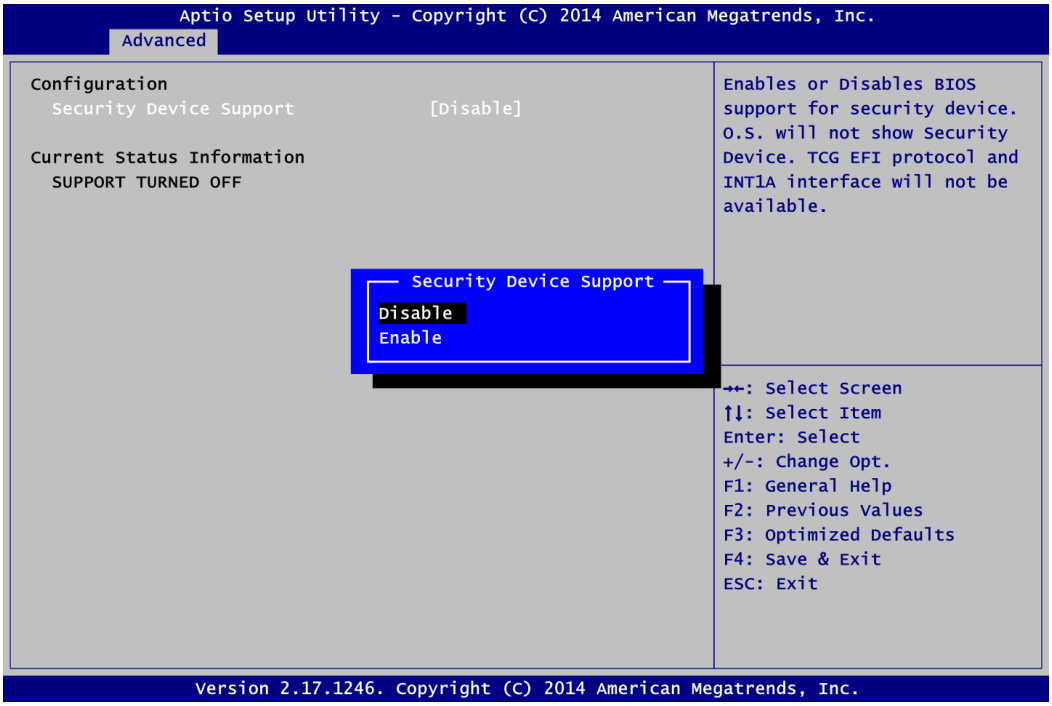


- **ACPI Settings**
  You can use this screen to select options for the ACPI configuration, and change the value of the selected option. A description of the selected item appears on the right side of the screen.

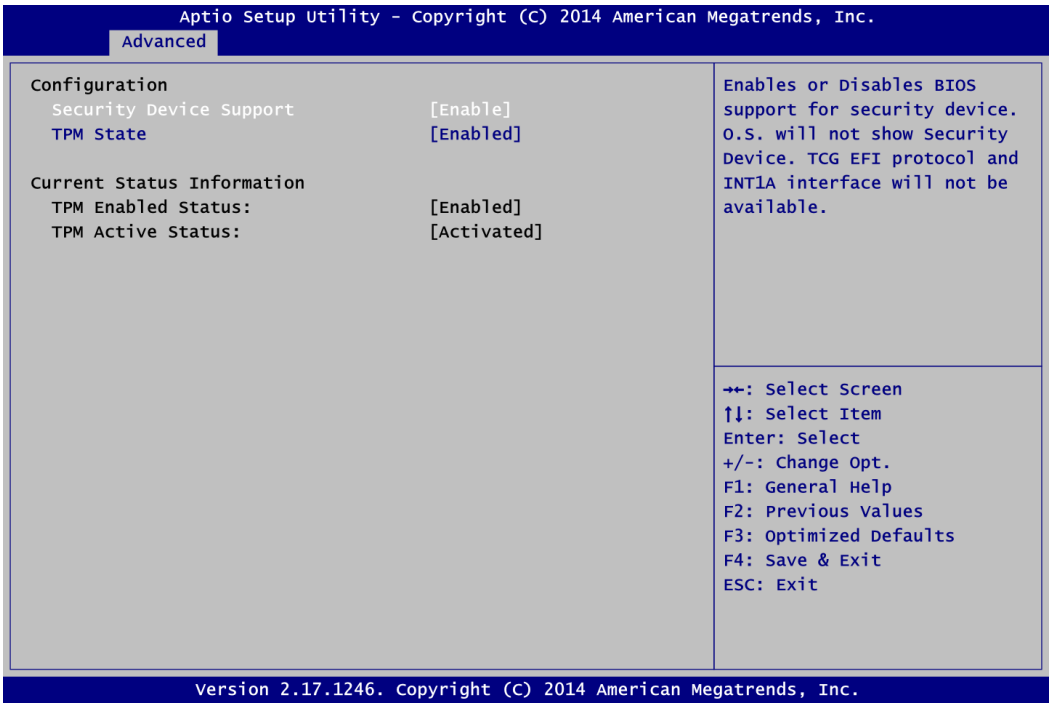

Aptio Setup Utility - Copyright (C) 2014 American Megatrends, Inc.
Advanced
ACPI Settings
ACPI Sleep State
[S3 only(Suspend to ...]
Select ACPI sleep state the system will enter when the SUSPEND button is pressed.
ACPI Sleep State
Suspend Disabled
S3 only(Suspend to RAM)
→←: Select Screen
↑↓: Select Item
Enter: Select
+/-: Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
ESC: Exit
Version 2.17.1246. Copyright (C) 2014 American Megatrends, Inc.

ACPI Sleep State
Select the ACPI (Advanced Configuration and Power Interface) sleep state. Configuration options are Suspend Disabled and S3 only (Suspend to RAM). The S3 only (Suspend to RAM) option selects ACPI sleep state the system will enter when suspend button is pressed.

- **Trusted Computing**
  You can use this screen for TPM (Trusted Platform Module) configuration. It also shows current TPM status information.


Aptio Setup Utility - Copyright (C) 2014 American Megatrends, Inc.
Advanced
Configuration
Security Device Support [Disable]
Current Status Information
SUPPORT TURNED OFF
Enables or Disables BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.
Security Device Support
Disable
Enable
→←: Select Screen
↑↓: Select Item
Enter: Select
+/-: Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
ESC: Exit
Version 2.17.1246. Copyright (C) 2014 American Megatrends, Inc.

Security Device Support
Enable or disable BIOS support for security device. The default is Disabled.

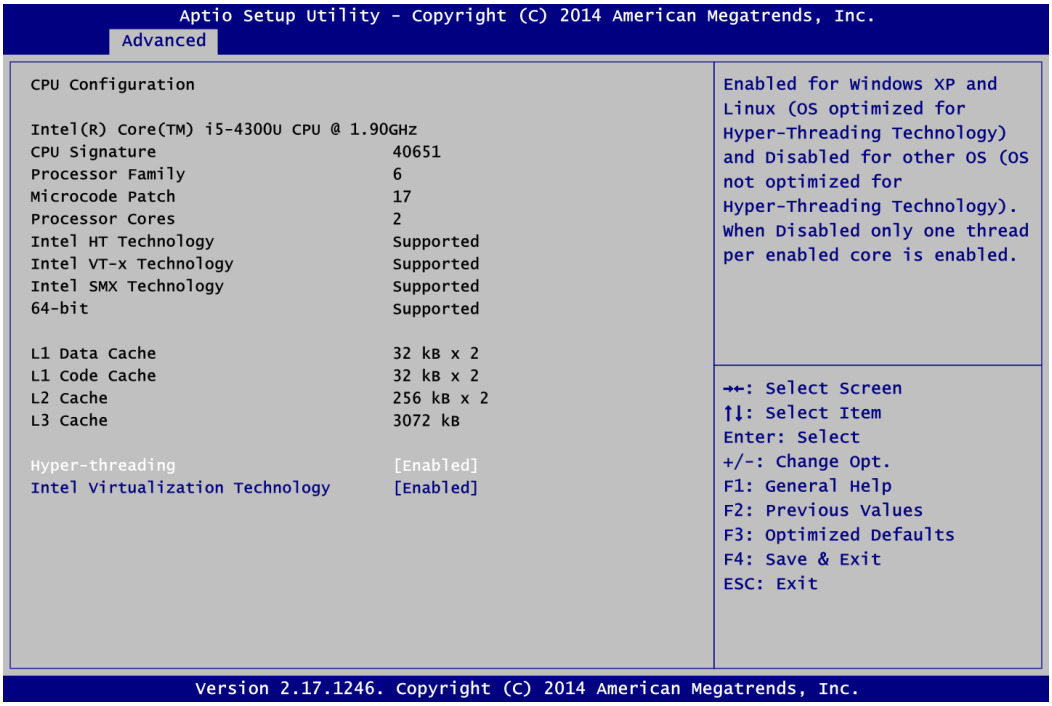

Aptio Setup Utility - Copyright (C) 2014 American Megatrends, Inc.
Advanced
Configuration
Security Device Support [Enable]
TPM State [Enabled]
Current Status Information
TPM Enabled Status: [Enabled]
TPM Active Status: [Activated]
Enables or Disables BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.
→←: Select Screen
↑↓: Select Item
Enter: Select
+/-: Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
ESC: Exit
Version 2.17.1246. Copyright (C) 2014 American Megatrends, Inc.

Security Device Support
Enable or disable BIOS support for security device. Once the Security Device Support is Enabled, TPM can be used by the operating system.

TPM State
Specify whether TPM can be used by the operating system.

Current Status Information
Display current TPM status information.

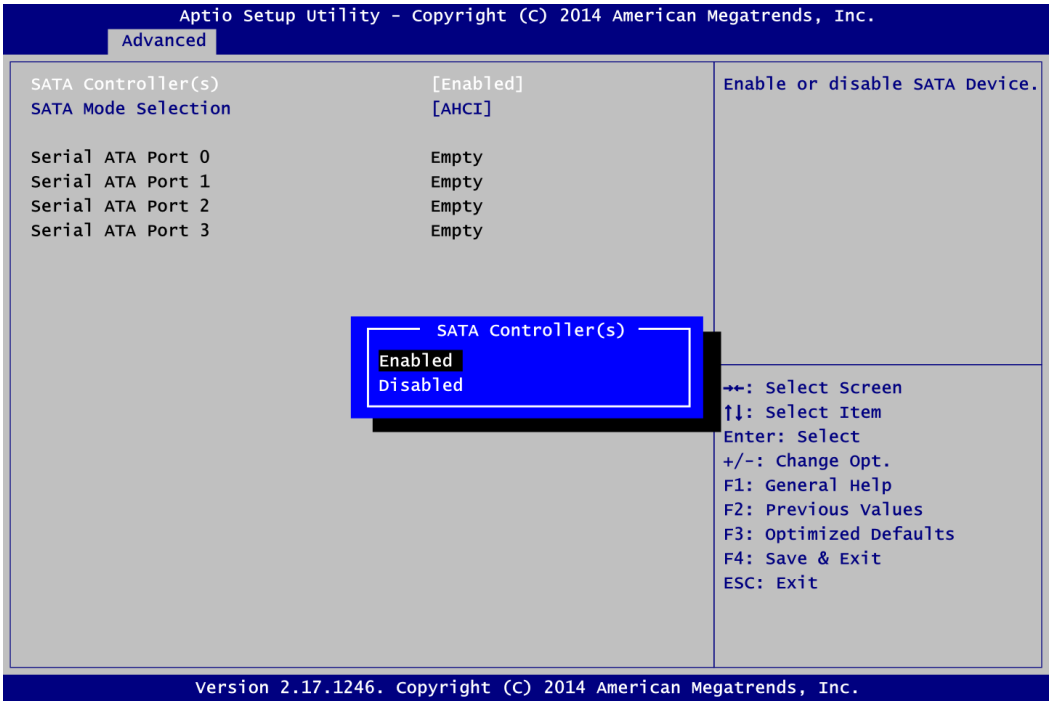
- **CPU Configuration**
  This screen shows the CPU Configuration, and you can change the value of the selected option.


Aptio Setup Utility - Copyright (C) 2014 American Megatrends, Inc.
Advanced
CPU Configuration
Intel(R) Core(TM) i5-4300U CPU @ 1.90GHz
CPU Signature 40651
Processor Family 6
Microcode Patch 17
Processor Cores 2
Intel HT Technology Supported
Intel VT-x Technology Supported
Intel SMX Technology Supported
64-bit Supported
L1 Data Cache 32 kB x 2
L1 Code Cache 32 kB x 2
L2 Cache 256 kB x 2
L3 Cache 3072 kB
Hyper-threading [Enabled]
Intel Virtualization Technology [Enabled]
Enabled for Windows XP and Linux (OS optimized for Hyper-Threading Technology) and Disabled for other OS (OS not optimized for Hyper-Threading Technology). When Disabled only one thread per enabled core is enabled.
→←: Select Screen
↑↓: Select Item
Enter: Select
+/-: Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
ESC: Exit
Version 2.17.1246. Copyright (C) 2014 American Megatrends, Inc.

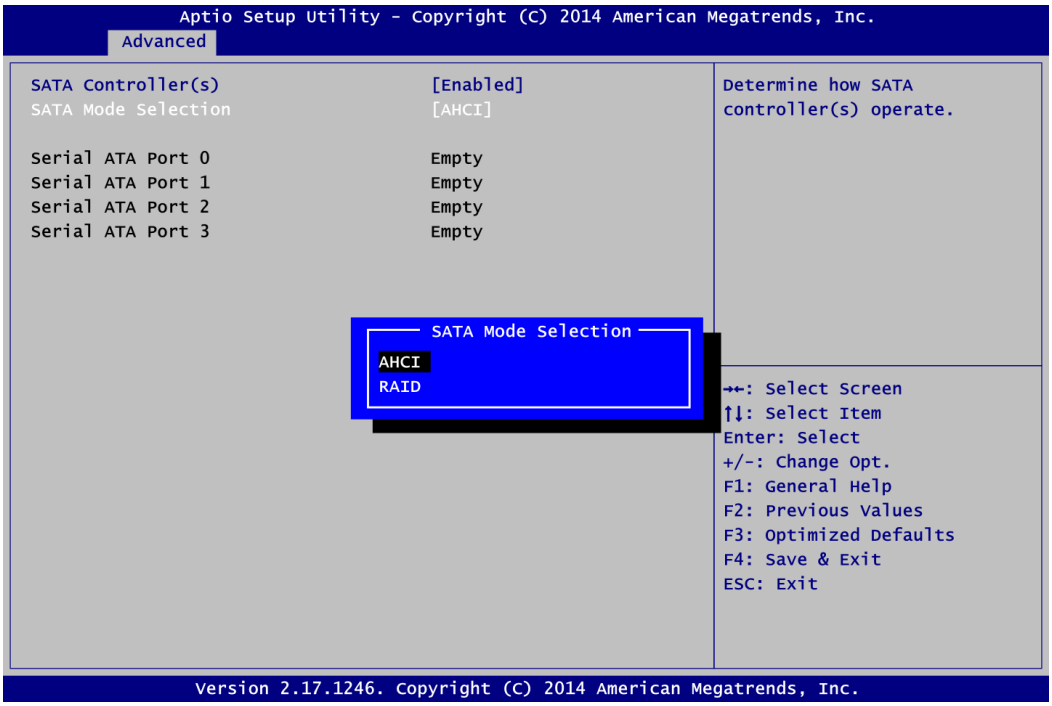
Hyper-threading
Enable or disable Hyper-threading Technology, which allows a single physical processor to multitask as multiple logical processors. When disabled, only one thread per enabled core is enabled.

Intel Virtualization Technology
Enable or disable Intel Virtualization Technology. When enabled, a VMM can utilize the additional hardware capabilities. It allows a platform to run multiple operating systems and applications independently, hence enabling a computer system to work as several virtual systems.

- **SATA Configuration**
  In the SATA Configuration menu, you can see the currently installed hardware in the SATA ports. During system boot up, the BIOS automatically detects the presence of SATA devices.

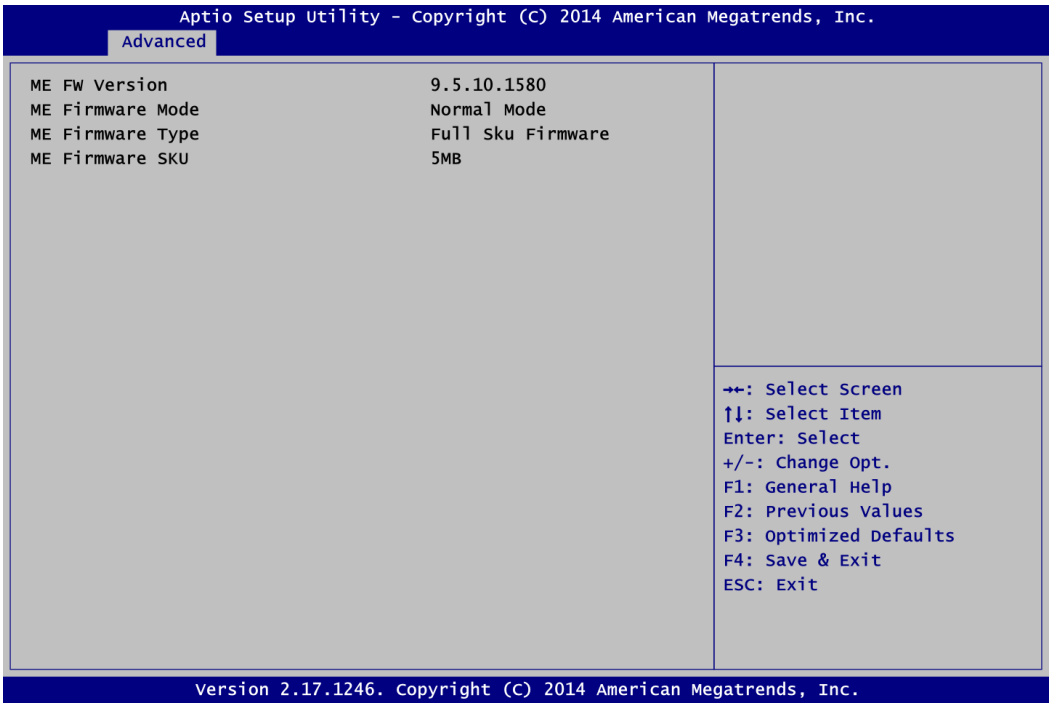


SATA Controller(s)
Enable or disable SATA device.

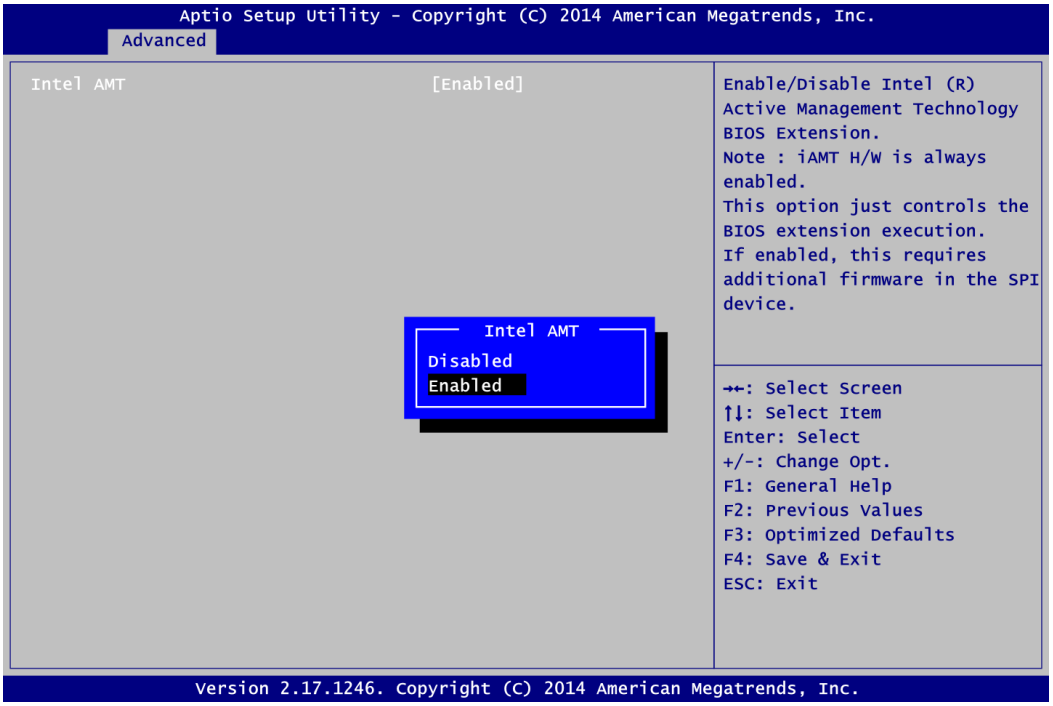


SATA Mode Selection
Determine how SATA controller(s) operate. Operation modes are AHCI Mode and RAID Mode.

- **PCH-FW Configuration**
  This screen displays ME Firmware information.

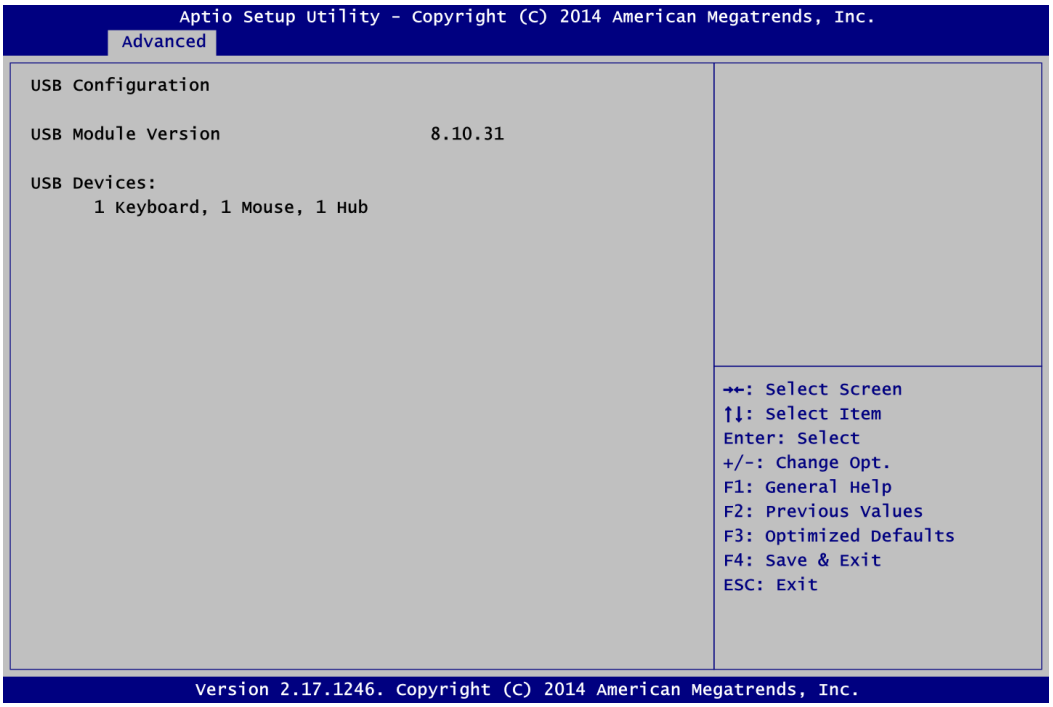

Aptio Setup Utility - Copyright (C) 2014 American Megatrends, Inc.
Advanced
ME FW Version 9.5.10.1580
ME Firmware Mode Normal Mode
ME Firmware Type Full Sku Firmware
ME Firmware SKU 5MB
→←: Select Screen
↑↓: Select Item
Enter: Select
+/-: Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
ESC: Exit
Version 2.17.1246. Copyright (C) 2014 American Megatrends, Inc.

- **AMT Configuration**
  Use this screen to configure AMT parameters.


Aptio Setup Utility - Copyright (C) 2014 American Megatrends, Inc.
Advanced
Intel AMT [Enabled]
Enable/Disable Intel (R) Active Management Technology BIOS Extension.
Note : iAMT H/W is always enabled.
This option just controls the BIOS extension execution.
If enabled, this requires additional firmware in the SPI device.
Intel AMT
Disabled
Enabled
→←: Select Screen
↑↓: Select Item
Enter: Select
+/-: Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
ESC: Exit
Version 2.17.1246. Copyright (C) 2014 American Megatrends, Inc.

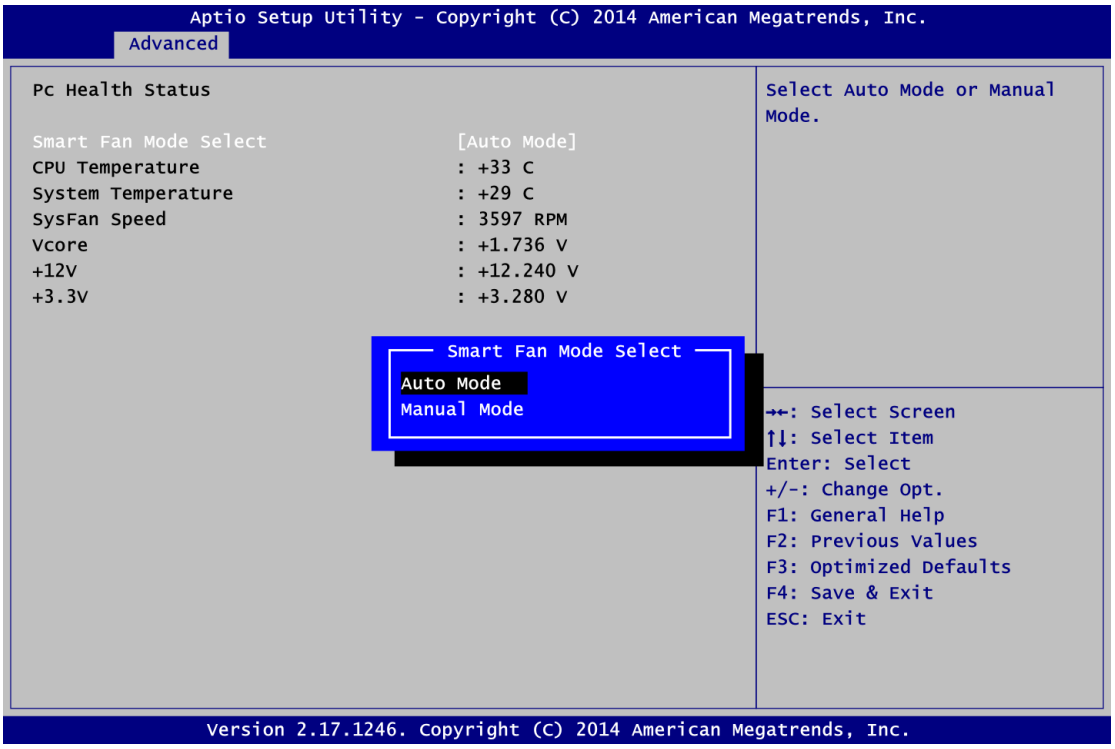
Intel AMT
Enable or disable Intel® Active Management Technology BIOS Extension. The default is Enabled.

- **USB Configuration**



USB Devices
Displays all detected USB devices.

- **F81803 HW Monitor**
  This screen is for Smart Fan configuration and hardware health status monitoring.


Aptio Setup Utility - Copyright (C) 2014 American Megatrends, Inc.
Advanced
Pc Health Status
Smart Fan Mode Select [Auto Mode]
CPU Temperature : +33 C
System Temperature : +29 C
SysFan Speed : 3597 RPM
Vcore : +1.736 V
+12V : +12.240 V
+3.3V : +3.280 V
Smart Fan Mode Select
Auto Mode
Manual Mode
Select Auto Mode or Manual Mode.
→←: Select Screen
↑↓: Select Item
Enter: Select
+/-: Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
ESC: Exit
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This screen displays the temperature of system and CPU, cooling fan speed in RPM and system voltages (Vcore, +12V and +3.3V).

Smart Fan Mode Select
Set Smart Fan mode. The default is Auto Mode. If Smart Fan is in Auto Mode, the system fan spins at different speed depending on system temperature; the higher the temperature, the faster the system fan spins. If Smart Fan is in Manual Mode, user can manually change system fan speed to 0%, 50%, 75% or 100%.

- **Second Super IO Configuration**
  You can use this screen to select options for the Second Super IO Configuration, and change the value of the selected option. A description of the selected item appears on the right side of the screen. For items marked with "▶", please press <Enter> for more options.

Serial Port 1 (COM1)~2 (COM2)
Set parameters of serial port 1 (COM1) ~ 2 (COM2).

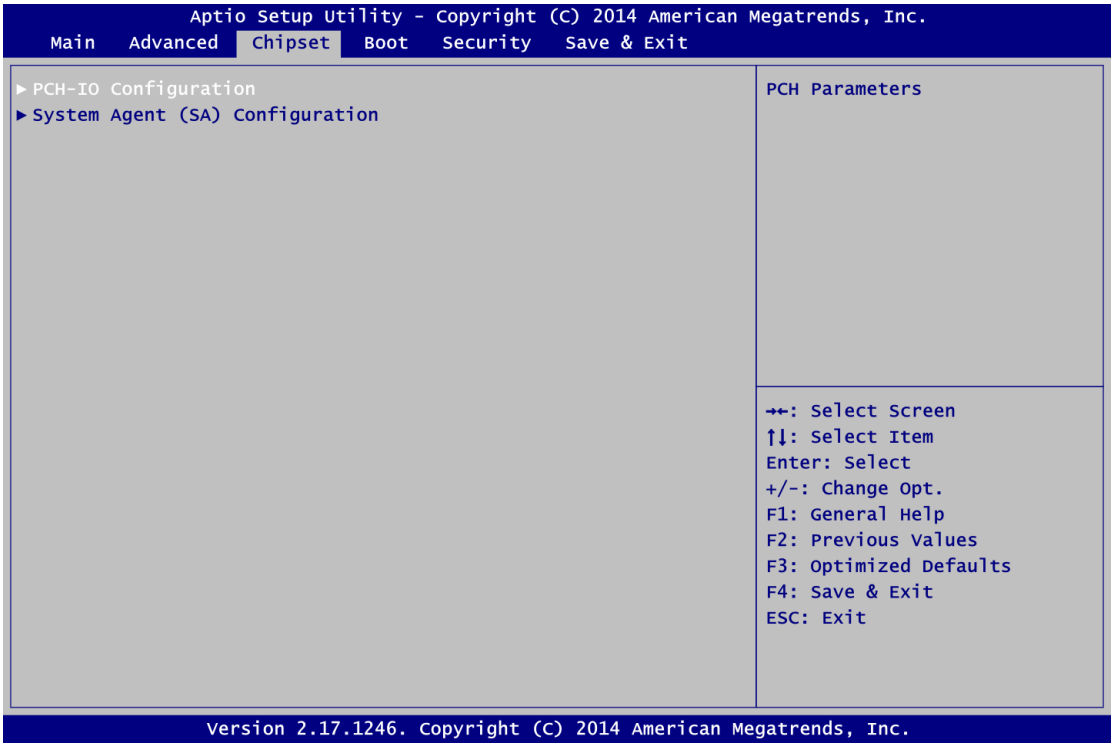
Parallel Port Configuration
Set parameters of parallel port.

4.5 Chipset Menu

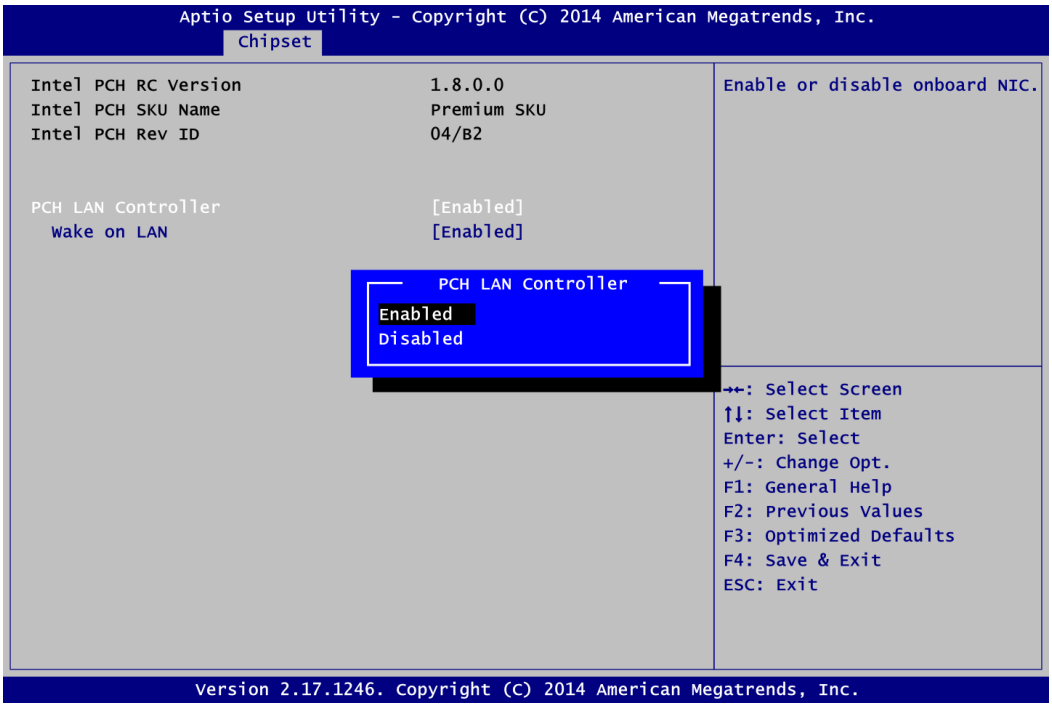
The Chipset menu allows users to change the advanced chipset settings. You can select any of the items in the left frame of the screen to go to the sub menus:

- ► PCH-IO Configuration
- ► System Agent (SA) Configuration

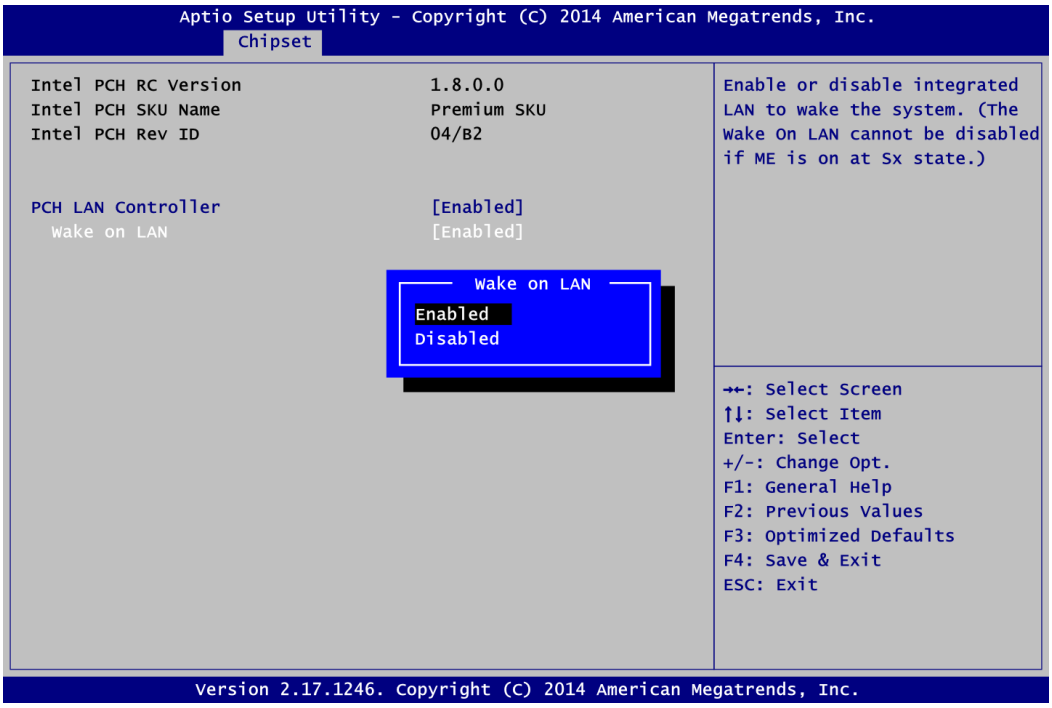
For items marked with "►", please press <Enter> for more options.



- **PCH-IO Configuration**

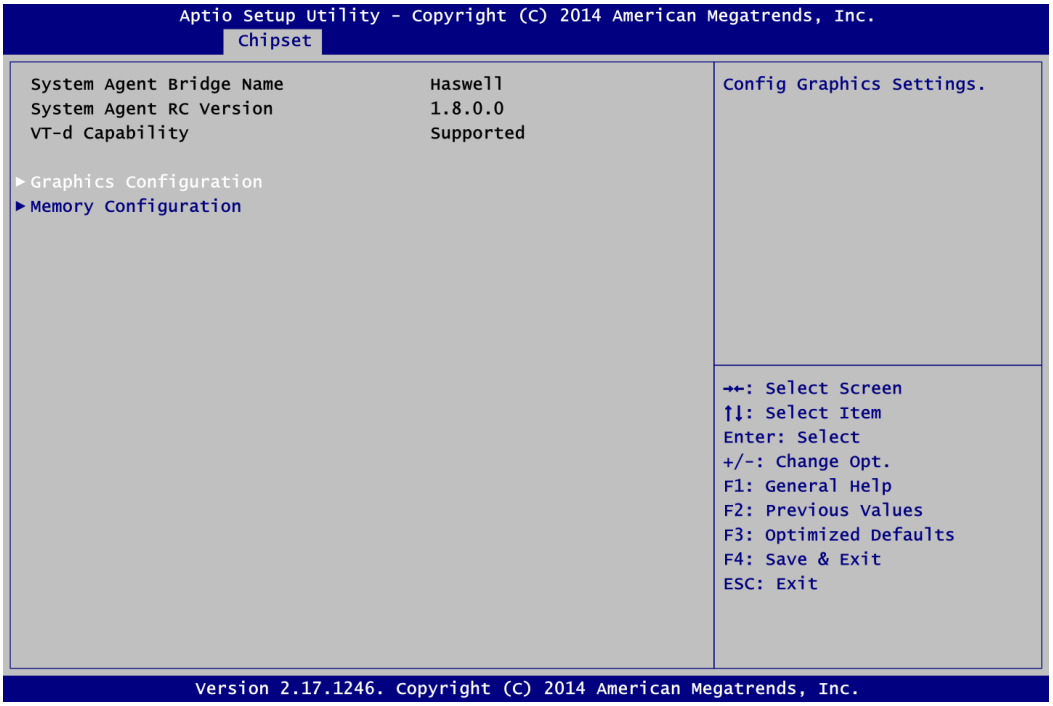


PCH LAN Controller
Enable or disable onboard PCH LAN controller.


Aptio Setup Utility - Copyright (C) 2014 American Megatrends, Inc.
Chipset
Intel PCH RC Version 1.8.0.0
Intel PCH SKU Name Premium SKU
Intel PCH Rev ID 04/B2
PCH LAN Controller [Enabled]
Wake on LAN [Enabled]
Wake on LAN
Enabled
Disabled
Enable or disable integrated LAN to wake the system. (The Wake On LAN cannot be disabled if ME is on at Sx state.)
→←: Select Screen
↑↓: Select Item
Enter: Select
+/-: Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
ESC: Exit
Version 2.17.1246. Copyright (C) 2014 American Megatrends, Inc.

Wake on LAN
Enable or disable integrated LAN to wake the system.

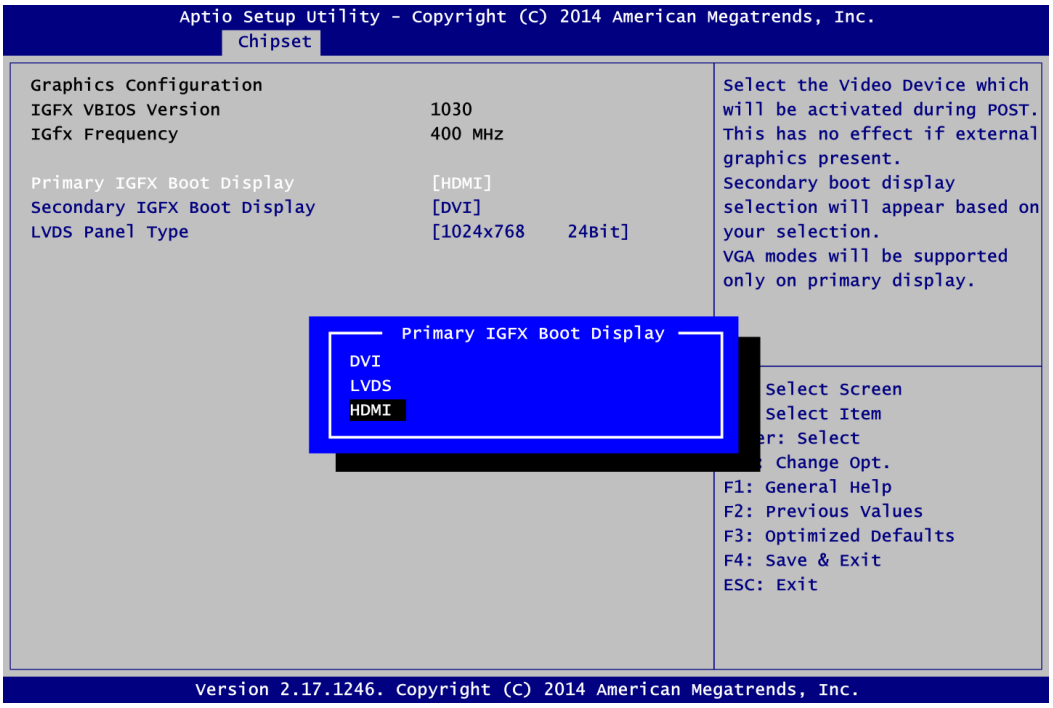
- **System Agent (SA) Configuration**
  This screen allows users to configure System Agent (SA) parameters. For items marked with "►", please press <Enter> for more options.



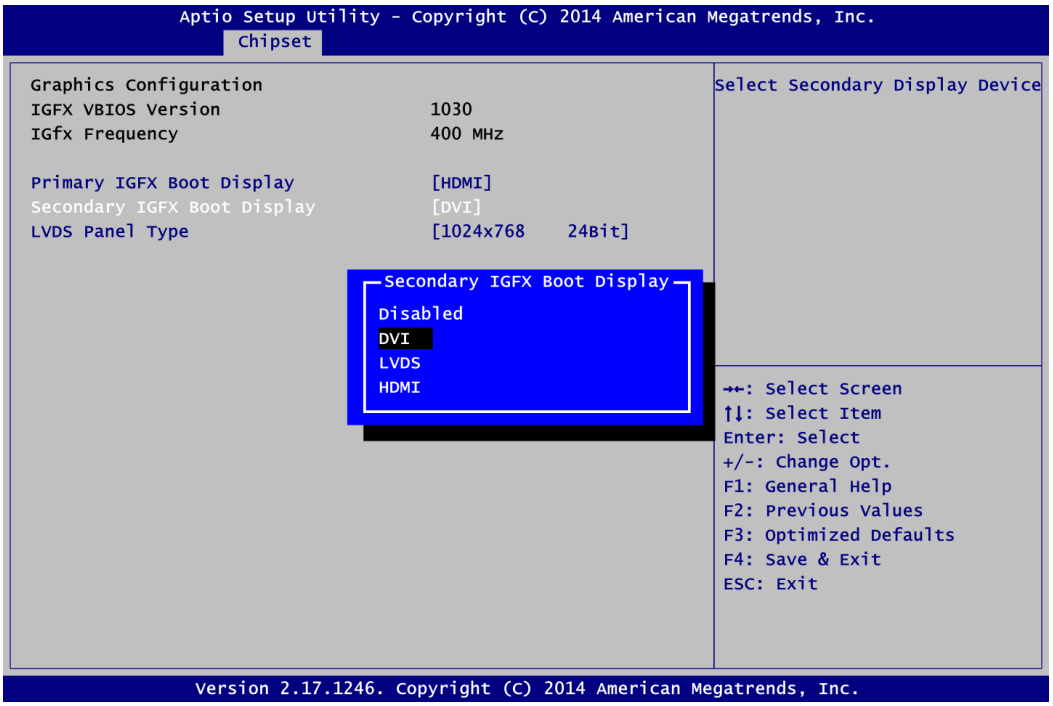
Graphics Configuration
Open sub menu for parameters related to graphics configuration.

Memory Configuration
Open sub menu for information related to system memory.

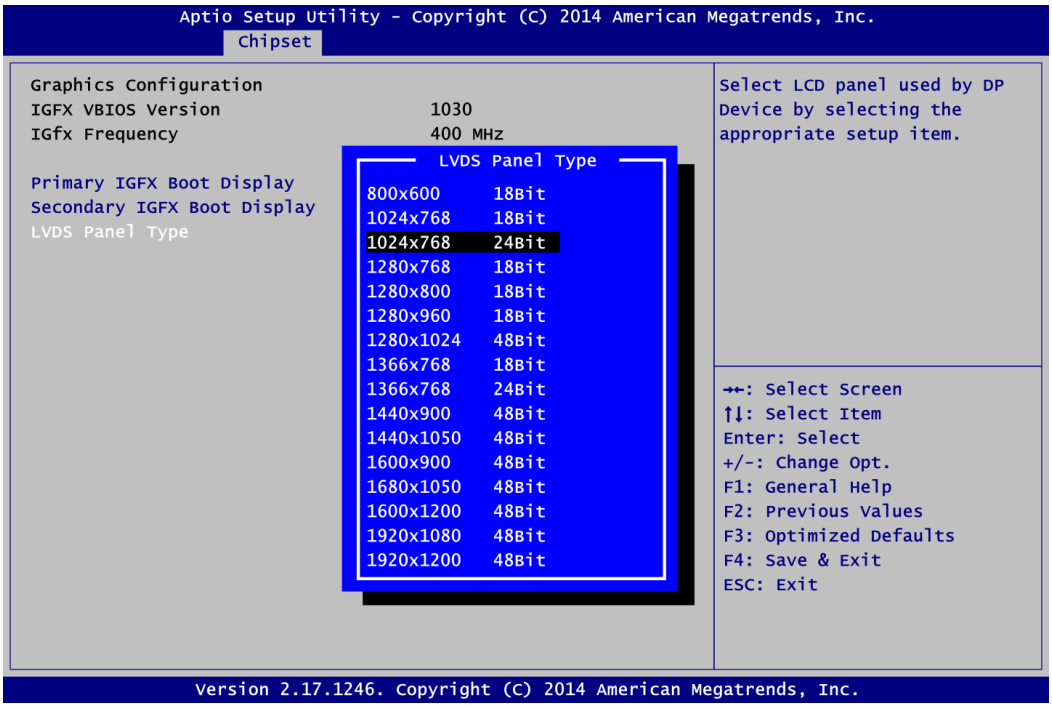
- **Graphics Configuration**


Aptio Setup Utility - Copyright (C) 2014 American Megatrends, Inc.
Chipset
Graphics Configuration
IGFX VBIOS Version 1030
IGfx Frequency 400 MHz
Primary IGFX Boot Display [HDMI]
Secondary IGFX Boot Display [DVI]
LVDS Panel Type [1024x768 24Bit]
Select the Video Device which will be activated during POST. This has no effect if external graphics present. Secondary boot display selection will appear based on your selection. VGA modes will be supported only on primary display.
Primary IGFX Boot Display
DVI
LVDS
HDMI
Select Screen
Select Item
Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
ESC: Exit
Version 2.17.1246. Copyright (C) 2014 American Megatrends, Inc.

Primary IGFX Boot Display
Select the display device which will be activated during POST (Power-On Self Test). The default is HDMI. Configuration options are DVI, LVDS and HDMI.

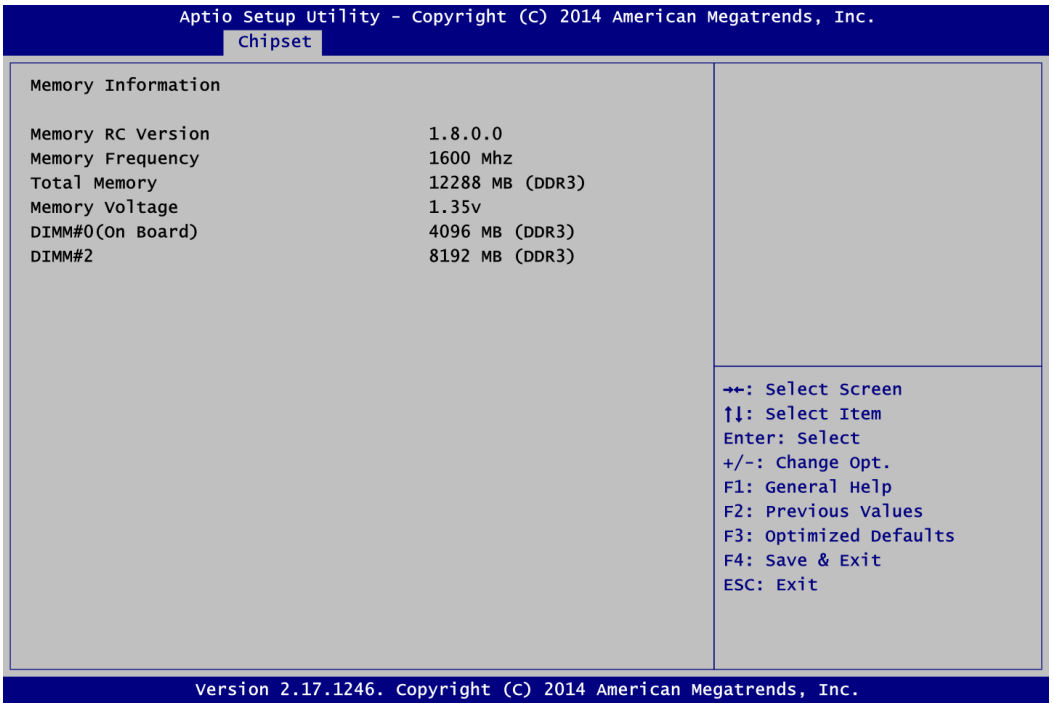


Secondary IGFX Boot Display
Select secondary display device. The default is DVI. Configuration options are Disabled, DVI, LVDS and HDMI.



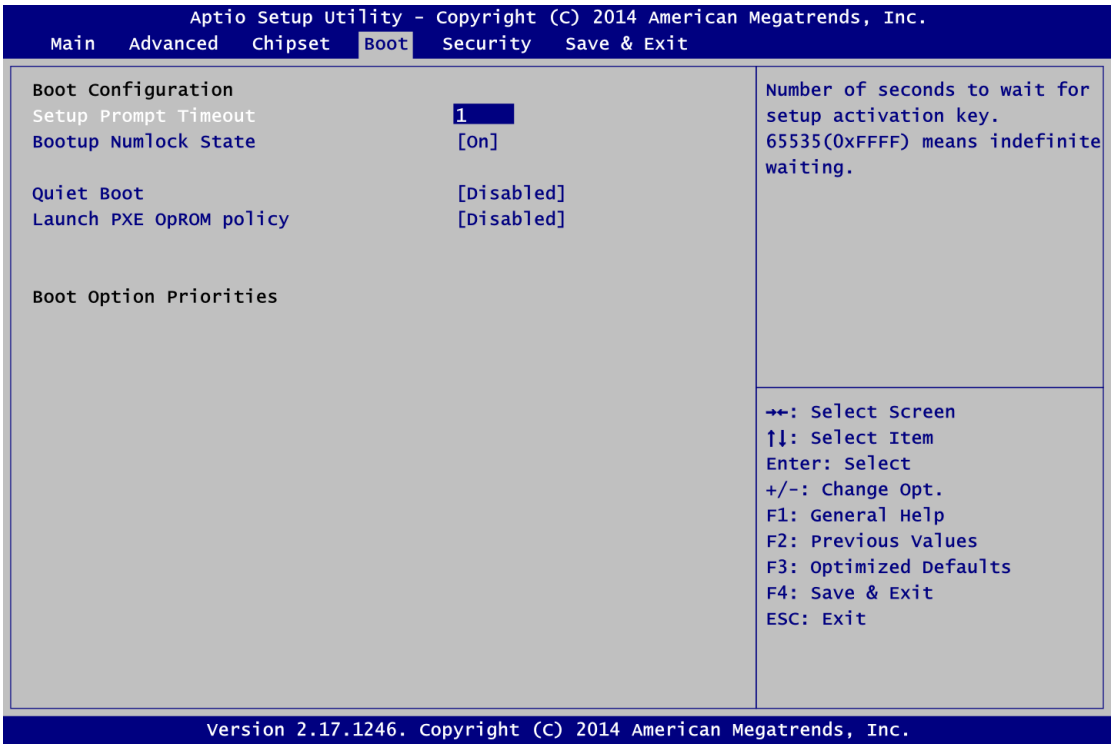
LVDS Panel Type
Select LVDS panel resolution.

- **Memory Configuration**
  This screen shows the system memory information.



4.6 Boot Menu

The Boot menu allows users to change boot options of the system.



- **Setup Prompt Timeout**
  Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.

- **Bootup NumLock State**
  Use this item to select the power-on state for the keyboard NumLock.

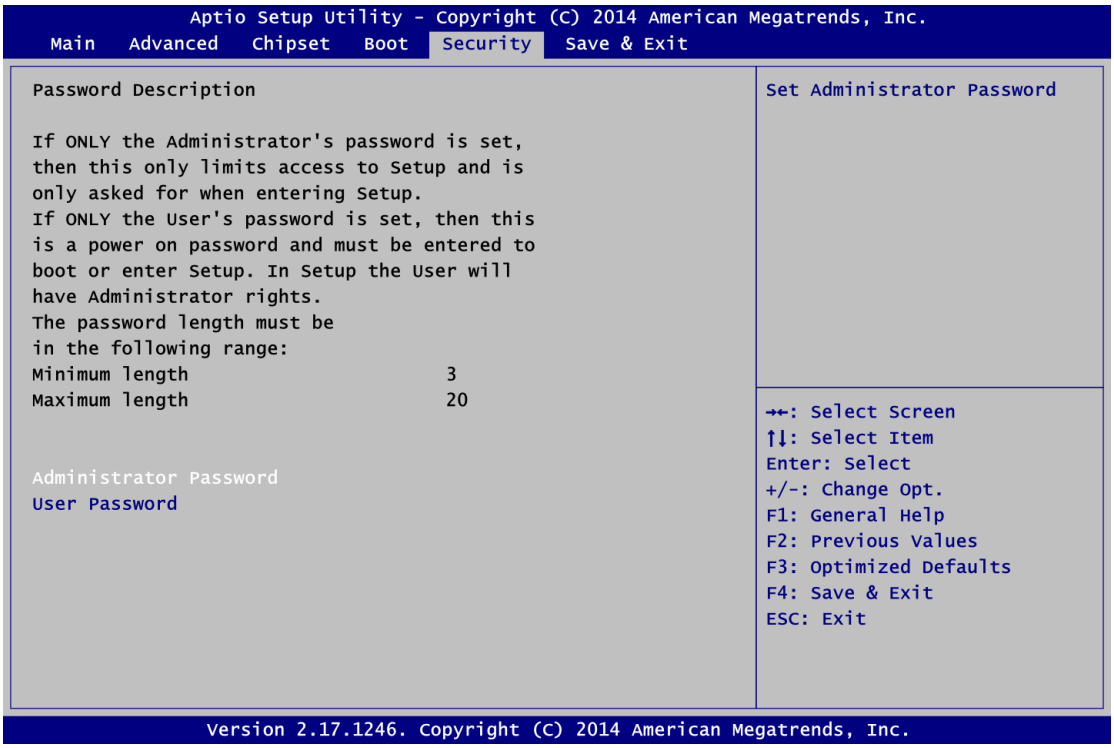
- **Quiet Boot**
  Select to display either POST output messages or a splash screen during boot-up.

- **Launch PXE OpROM policy**
  Use this item to enable or disable the boot ROM function of the onboard LAN chip when the system boots up.

- **Boot Option Priorities**
  These are settings for boot priority. Specify the boot device priority sequence from the available devices.

4.7 Security Menu

The Security menu allows users to change the security settings for the system.

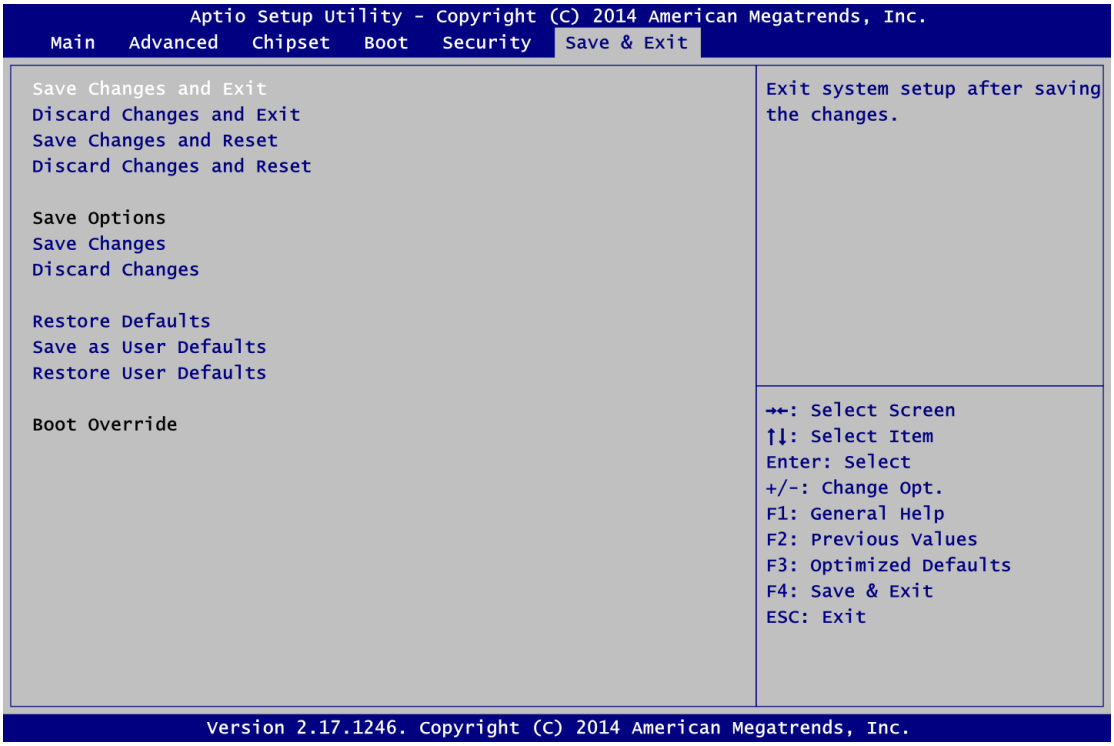

Aptio Setup Utility - Copyright (C) 2014 American Megatrends, Inc.
Main Advanced Chipset Boot Security Save & Exit
Password Description
If ONLY the Administrator's password is set, then this only limits access to Setup and is only asked for when entering Setup.
If ONLY the User's password is set, then this is a power on password and must be entered to boot or enter Setup. In Setup the User will have Administrator rights.
The password length must be in the following range:
Minimum length 3
Maximum length 20
Administrator Password
User Password
Set Administrator Password
→←: Select Screen
↑↓: Select Item
Enter: Select
+/-: Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
ESC: Exit
Version 2.17.1246. Copyright (C) 2014 American Megatrends, Inc.

- **Administrator Password**
  Set administrator password.

- **User Password**
  Set user password.

4.8 Save & Exit Menu

The Save & Exit menu allows users to load your system configuration with optimal or fail-safe default values.



- **Save Changes and Exit**
  When you have completed the system configuration changes, select this option to leave Setup and return to Main Menu. Select Save Changes and Exit from the Save & Exit menu and press <Enter>. Select Yes to save changes and exit.

- **Discard Changes and Exit**
  Select this option to quit Setup without making any permanent changes to the system configuration and return to Main Menu. Select Discard Changes and Exit from the Save & Exit menu and press <Enter>. Select Yes to discard changes and exit.

- **Save Changes and Reset**
  When you have completed the system configuration changes, select this option to leave Setup and reboot the computer so the new system configuration parameters can take effect. Select Save Changes and Reset from the Save & Exit menu and press <Enter>. Select Yes to save changes and reset.

- **Discard Changes and Reset**
  Select this option to quit Setup without making any permanent changes to the system configuration and reboot the computer. Select Discard Changes and Reset from the Save & Exit menu and press <Enter>. Select Yes to discard changes and reset.

- **Save Changes**
  When you have completed the system configuration changes, select this option to save changes. Select Save Changes from the Save & Exit menu and press <Enter>. Select Yes to save changes.

- **Discard Changes**
  Select this option to quit Setup without making any permanent changes to the system configuration. Select Discard Changes from the Save & Exit menu and press <Enter>. Select Yes to discard changes.

- **Restore Defaults**
  It automatically sets all Setup options to a complete set of default settings when you select this option. Select Restore Defaults from the Save & Exit menu and press <Enter>.

- **Save as User Defaults**
  Select this option to save system configuration changes done so far as User Defaults. Select Save as User Defaults from the Save & Exit menu and press <Enter>.

- **Restore User Defaults**
  It automatically sets all Setup options to a complete set of User Defaults when you select this option. Select Restore User Defaults from the Save & Exit menu and press <Enter>.

- **Boot Override**
  Select a drive to immediately boot that device regardless of the current boot order.

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Appendix A
Watchdog Timer and GPIO

A.1 About Watchdog Timer

Software stability is major issue in most application. Some embedded systems are not watched by human for 24 hours. It is usually too slow to wait for someone to reboot when computer hangs. The systems need to be able to reset automatically when things go wrong. The watchdog timer gives us solution.

The watchdog timer is a counter that triggers a system reset when it counts down to zero from a preset value. The software starts counter with an initial value and must reset it periodically. If the counter ever reaches zero which means the software has crashed, the system will reboot.

A.2 How to Use Watchdog Timer

The following example enables configuration using debug tool.

Enable WDT
↓
1. Enable configuration:
-O 4E 87 ; Un-lock super I/O
-O 4E 87
↓
2. Select Logic device:
-O 4E 07
-O 4F 07
↓
3. WDT device enable:
-O 4E 30
-O 4F 01
↓
4. Set timer unit:
-O 4E F0
-O 4F 80
↓
5. Set base timer:
-O 4E F6
-O 4F 0A ; Set reset time (where 0A (hex) = 10sec)
↓
6. Set timer unit (second or minute):
-O 4E F5
-O 4F 71 ; Set timer unit
; (where 1:timer unit=second, 9:timer unit=minute)
↓
7. Exit configuration:
-O 4E AA

A.3 About GPIO

The onboard GPIO (general input and output) has 8 bits (GPI0~3 and GPO0~3). In default, all pins are pulled high with +3.3V level (according to main power). The BIOS default settings are 4 input pins set to high level and 4 output pins set to low level.

A.4 How to Use GPIO

The following example enables configuration (from CEM881 FINTEK F75111R).

Sample Program

```
/*---------------- INCLUDE FILE ----------------------*/
#include <stdio.h>
#include <conio.h>
#include <bios.h>
#include <dos.h>
#define UCHAR   unsigned char
#define UINT    unsigned int
#define SMIOBASE       0xF000
/******************
       SMIOBASE can get from PCI device Bus-0,Device-31, Function-3
       Register 20h~23h, the value is the IO base address.
*******************/
#define SM_REG         (SMIOBASE+3)
#define SM_ADDR        (SMIOBASE+4)
#define SM_DATA        (SMIOBASE+5)
#define SM_CMD         (SMIOBASE+2)
#define SM_STATUS      (SMIOBASE+0)
#define SM_byteAccess 0x48
#define Device_Addr    0x6E  /*depend on hardware designed Low:0x9C, High:0x6E*/
UCHAR _read_smbus(UCHAR ,UCHAR);
void _write_smbus(UCHAR,UCHAR, UCHAR);
#define F75111_CHIPID           0x0003
#define F75111_VENDORID         0x3419

/* ------------------ MAIN PROGRAM -------------------*/
main()
{
UCHAR   xch,xch2;
UINT    chipid=0, vendorid=0;
       //Check the Chip ID information
       xch=_read_smbus(Device_Addr,0x5a);     //Chip ID 1
       xch2=_read_smbus(Device_Addr,0x5b);    //Chip ID 2
       chipid=((UINT)xch2 << 8) + (UINT)xch;
       xch=_read_smbus(Device_Addr,0x5d);     //Vendor ID 1
       xch2=_read_smbus(Device_Addr,0x5E);    //Vendor ID 2
       vendorid=((UINT)xch2 << 8) + (UINT)xch;
       if (F75111_CHIPID != chipid || F75111_VENDORID != vendorid )
         { printf("!!! Not found F75111 chip !!!\n");
           exit(-1);
         }
       printf("=== Found F75111 chip ===\n");
       printf("=== GPIO Output Test ===\n");

       //set GPIO3x  direction
       printf("Set F75111 GPIO3x pin is output direction\n");
       _write_smbus(Device_Addr,0x40,0x0f);   //GPIO3x Output direction

       //set GPIO3x output level or plus
       printf("Set F75111 GPIO3x pin is output Level\n");
       _write_smbus(Device_Addr,0x43,0);      //GPIO3x Level control

       //write GPIO3x data
       printf("Write GPIO3x data is 0x0A\n");
```

```
        printf("GPO0=0, GPO1=1, GPO2=0, GPO3=1\n");
        _write_smbus(Device_Addr,0x41,0x0a);
        printf("Please check the GPO level and hit any key to continue\n");
        getch();

        //write GPIO3x data
        printf("Write GPIO3x data is 0x05\n");
        printf("GPO0=1, GPO1=0, GPO2=1, GPO3=0\n");
        _write_smbus(Device_Addr,0x41,0x05);
        printf("Please check the GPO level and hit any key to continue\n");
        getch();


        //set GPIO10,11,12 used
        printf("=== GPIO Input Test ===\n");
        printf("Set F75111 GPIO1x is used GPIO function\n");
        xch=_read_smbus(Device_Addr,0x03);
        xch &= 0xE0 ;
        _write_smbus(Device_Addr,0x03,xch);    //set Pin GPIO10/11/12 used
        _write_smbus(Device_Addr,0x04,0);      //set Pin GPIO1x used

        printf("Set F75111 GPIO10,11,12,13 is input function\n");
        _write_smbus(Device_Addr,0x10,0x00);   //set GPIO1x input direction

        printf("Set F75111 GPIO10,11,12,13 is Level mode\n");
        _write_smbus(Device_Addr,0x13,0x00);   //set GPIO1x Level Control

        xch=_read_smbus(Device_Addr,0x12);     //read GPIO1x Status
        printf("Read the GPI0,1,2,3 input data is %02X\n",xch);
        printf("Please Change the GPIx input and hit any key to continue\n");
        getch();
        xch=_read_smbus(Device_Addr,0x12);     //read GPIO1x Status
        printf("Read the GPI0,1,2,3 input data is %02X\n",xch);
        printf("Please Change the GPIx input and hit any key to continue\n");
        getch();
        xch=_read_smbus(Device_Addr,0x12);     //read GPIO1x Status
        printf("Read the GPI0,1,2,3 input data is %02X\n",xch);

}

void _write_smbus(UCHAR xAddr,UCHAR xReg, UCHAR xData)
{
        while (1)
        { if (_check_smbus_busy()==0) break;
        }
        outp(SM_REG, xReg);
        xdelay();             //because the CPU too fast,delay for IO
        outp(SM_ADDR, xAddr);
        xdelay();             //because the CPU too fast,delay for IO
        outp(SM_DATA, xData);
        xdelay();             //because the CPU too fast,delay for IO
        outp(SM_CMD, SM_byteAccess);
        xdelay();             //because the CPU too fast,delay for IO
        outp(SM_STATUS, 02); //clear interrupt status
}

UCHAR _read_smbus(UCHAR xAddr,UCHAR xReg)
{
UCHAR  xch,xch2;
        while (1)
        { if (_check_smbus_busy()==0) break;
        }
        outp(SM_REG, xReg);
        xdelay();             //because the CPU too fast,delay for IO
        outp(SM_ADDR, xAddr+1);
        xdelay();             //because the CPU too fast,delay for IO
        outp(SM_CMD, SM_byteAccess);
        xdelay();             //because the CPU too fast,delay for IO
        while (1)
        { if (_check_smbus_busy()==0) break;
        }
        xch=inp(SM_DATA);
        xdelay();             //because the CPU too fast,delay for IO
        outp(SM_STATUS, 2);  //clear interrupt status
        return xch;
}
```

```
_check_smbus_busy(void)
{
UCHAR   xch;
       xch=inp(SM_STATUS);
       if (xch & 0x02 ) outp(SM_STATUS, 2);   //clear interrupt status
       if ( xch & 0x02 ) return 1;
       if ( xch & 0x01 ) return 1;
       return 0;
}

xdelay()
{
int    xxi,xxj,xxk=0;
       for (xxi=0 ; xxi< 0x1000 ; xxi++) {
              for (xxj=0 ; xxj < 0x100 ; xxj++) {
                     xxk++;
              }
       }
}
```